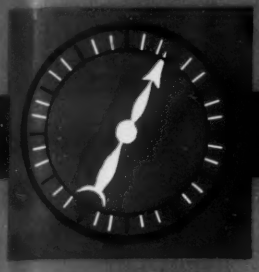
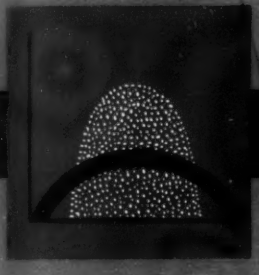
MARCH 1956

FOUNDRY

A PENTON PUBLICATION

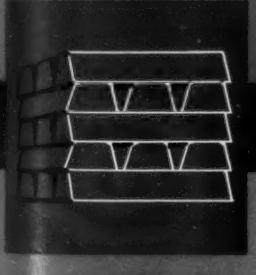


High-Pressure Molding



Dry Sand Reclamation

Thermal Studies of Shell Molds



Brass Foundry Alloys

CO_2 Hardening of Sand

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Q. What **ADDS** to gray iron **QUALITY** yet **SAVES** on casting **COST**?

A. FERROCARBO® by CARBORUNDUM

REGISTERED TRADE MARK

THROWN INTO THE CHARGE, FERROCARBO® in patented briquette form, lets you give your customers gray iron castings that are finer-grained, denser, stronger... with fewer chilled spots and segregations. Machining tests in 11 leading shops prove that castings of gray iron treated with FERROCARBO® averaged 89.5% greater machinability per tool than untreated castings. And deoxidizing with FERROCARBO® generally permits use of cheaper melting materials in the charge... so *you* make worthwhile savings, while giving your customers *premium* castings.

OVER 600 LEADING FOUNDRIES are now using FERROCARBO® to produce superior castings—both gray iron and malleable. Are *you* among them?

GET THIS FREE BOOKLET! Gives benefits, results, instructions for use of FERROCARBO®. Write The Carborundum Company, Dept. F 84-511, Niagara Falls, N. Y.

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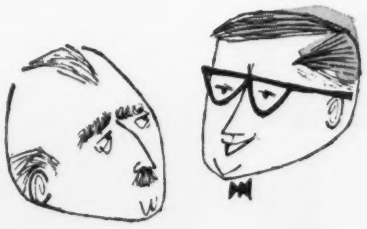
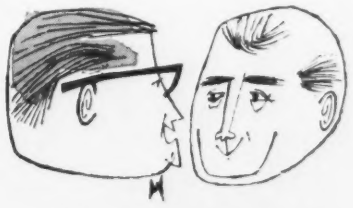
These days WISE MEN are talking savings

IN ELECTRIC FURNACES

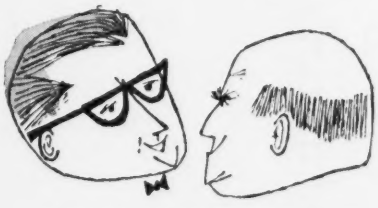


"The Whiting Hydro-Arc Furnace has real cost-saving advantages."



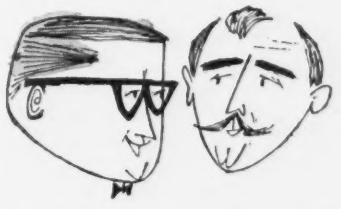
"Uni-directional electrode motors . . . no reversing."

"Arc regulation to a fixed standard."



"Electrode motors driven directly from arc-furnace bus without extra machinery."

"Regulated watt-input or heat-input to furnace. More efficient utilization of power input."



"Installation costs are lower—all these factors lead to better control and lowest cost per ton of melt."

"Only a few years ago, such electrode speed, acceleration and response were considered impossible."

"The least number of moving parts."

"Electrode consumption and refractory costs are lower."

"Let's send for the Whiting Arc Furnace Bulletin FY-168 . . . it gives all the facts!"

WHITING

HYDRO-ARC

WHITING CORPORATION

15607 Lathrop Avenue, Harvey, Illinois

For more information, use Reader Service Card, page 201

FEDERAL GREEN BOND BENTONITE

"the best of the bentonites"

and here's why . . .

LOW VISCOSITY ★

HIGH GREEN BOND STRENGTH

HIGH DRY BOND STRENGTH

Ph 9.0

DEPENDABLE UNIFORMITY

AVAILABLE IN PULVERIZED, GRANULAR AND SLURRY GRADES

★ Federal GREEN BOND'S low viscosity enables users to temper sand with less water, get optimum strength with less mulling time, when "dry ad-mixed" to sand. When used as a "slurry", up to 15% more GREEN BOND may be added to the water, to produce a more potent slurry and provide easier control of moisture and sand strength.

Write for your copy of "Teiler-Rodo Molding Sands".

THE FEDERAL FOUNDRY SUPPLY CO.

4600 EAST 71ST STREET · CLEVELAND 5, OHIO

FOUNDRY
A PENTON PUBLICATION

March 1956
Volume 84—Number 3

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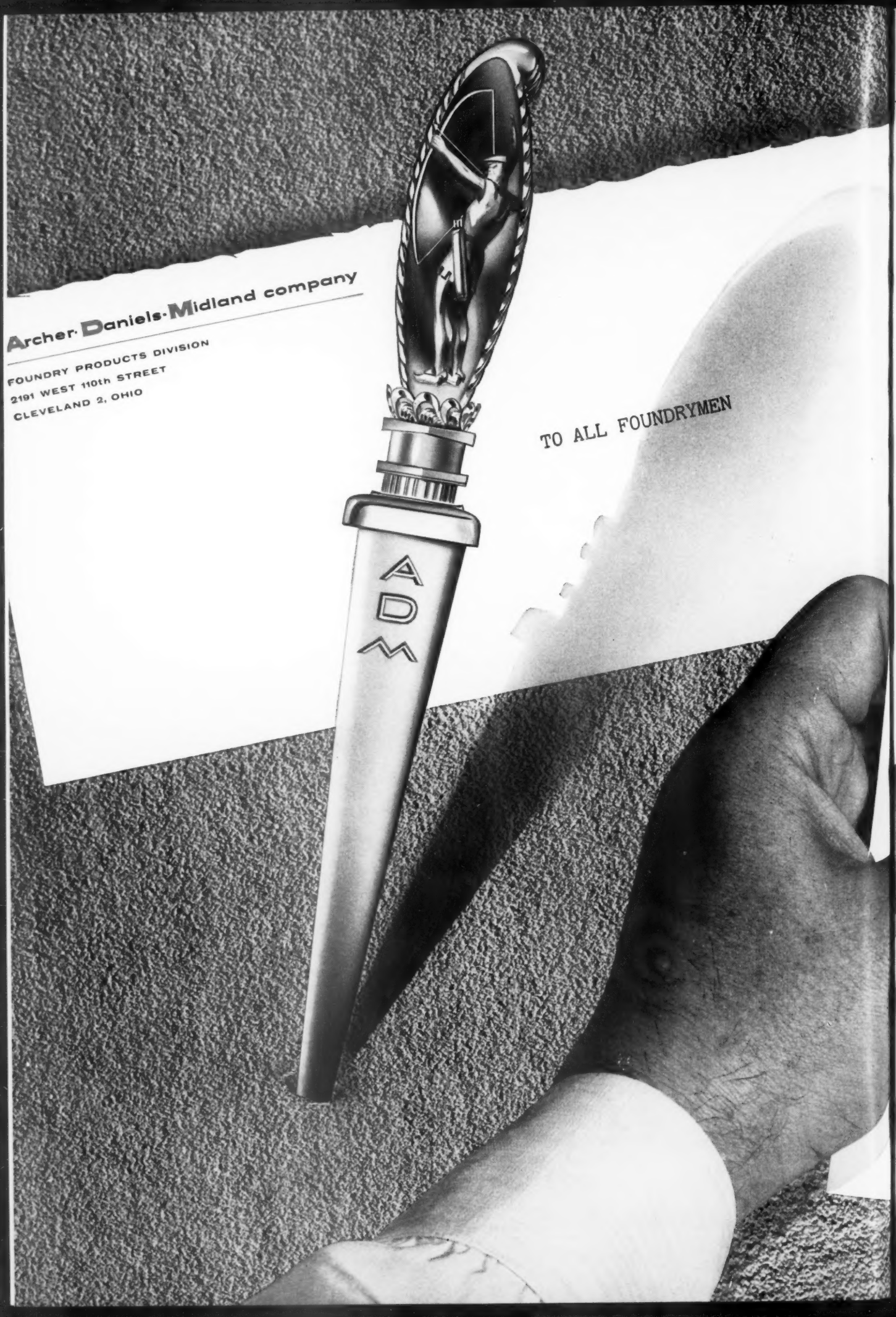
Published monthly by the Penton Publishing Co., Penton Building, Cleveland 13, O. Subscriptions in the United States, possessions and Canada, one year, $5; two years, $8. Other foreign countries, one year, $10. Single copies 75 cents. Copies published three or more months previous to date of current issue $1. Second class mail privileges authorized at Cleveland, O. Copyright, 1956, by the Penton Publishing Co.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CLEVELAND 2, OHIO

OPEN LETTER TO ALL FOUNDRYMEN:

The next step to making better, more uniform, lower-cost cores is <u>yours.</u> ADM can help you. Here's how:

1) ADM makes all types of binders: urea and phenol synthetic resins, alkyds, D process and C process binders, numerous specific-purpose LINOILS and several fast-baking INDUCTOLS. Therefore, we can impartially prescribe the type that is right for your specific application.

2) ADM core binders can often cut your core oil costs 10c to 40c per gallon due to our completely integrated production.

3) With 26 ADM warehouses and manufacturing facilities in 6 locations, you get overnight delivery anywhere in the country.

4) ADM's field organization (the largest in the business) is always at your service.

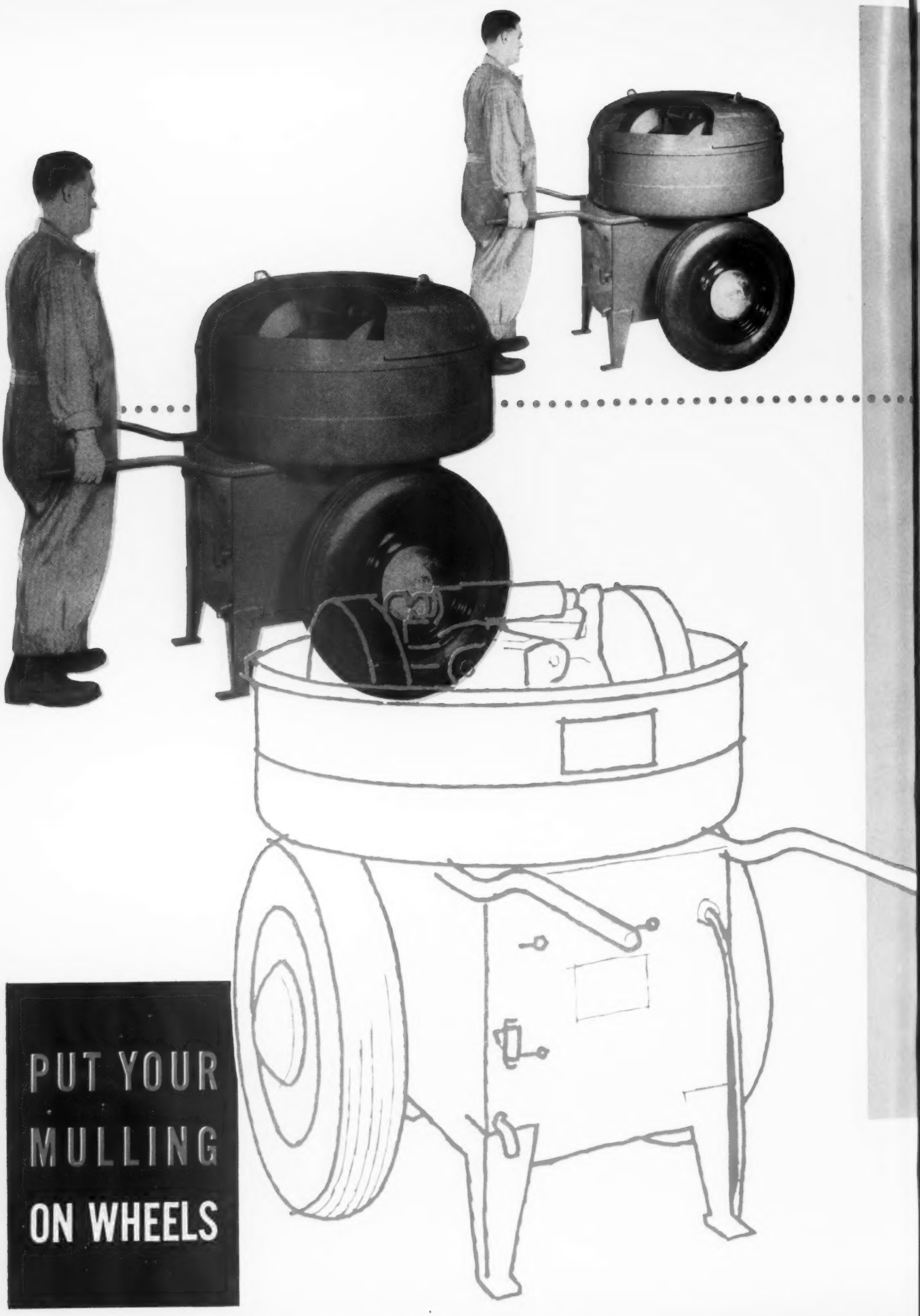
If you want to make a good casting better...if you are especially concerned about quality or uniformity of cores, see your ADM LINOIL man. Call him today.

Sincerely,

ARCHER-DANIELS-MIDLAND COMPANY
Foundry Products Division

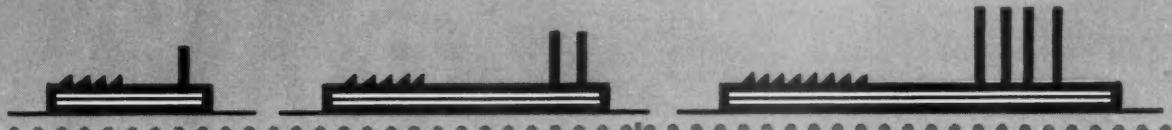
L. P. Robinson
Vice President

FOUNDRY PRODUCTS: LINOIL CORE OILS • INDUCTOL FAST BAKING CORE OILS • LIN-O-CEL SAND STABILIZER • FREFLO PARTING COMPOUND • ADMIREZ FOUNDRY RESIN



PUT YOUR MULLING ON WHEELS

ANY FOUNDRY HAS A JOB FOR SIMPSON Porto-Muller®



CO^2 process is another example of Porto-Muller versatility

Here's a completely self-contained, portable mixer "package" that can go anywhere in *any* foundry . . . to do a thorough *controlled* mixing job on any kind of sand.

From the toughest steel facing sand to the most intricate shell, "D" process or CO^2 sand—Porto-Muller handles them all! And it's built to the same high engineering standards that has paired the name Simpson with practical and dependably economical mixing practices for over 40 years.

The Porto-Muller is designed around the fact that it's cheaper and easier to bring the *muller* to small or special mixing jobs, than it is to bring the sand to the muller. That's why it's making real economy possible on hundreds of jobs where makeshift mixing practices formerly took a large toll in wasted core oils and binders. Pioneers in shell, "D" and CO^2 processing have relied on Porto-Muller, too—for dependably uniform blending of small batches.

Got a job for Porto-Muller? Whether it's a big one in a small foundry or a small job in a big foundry, Porto-Muller is a superior mixer on *any* job in *any* foundry . . . and it's a true package unit. You just plug it in and start mixing!

MIX ANY SAND, ANYWHERE IN YOUR SHOP

MOLDING OR FACING

Bentonite
Fire Clay
Cereal
Pitch
Gravel

Sand and binder are intimately blended. True mulling action disperses *all* binder, coats *each* grain.

CORE SANDS

oil or resin bonded

Intimate blending, maximum dispersion of expensive binders cuts costs while it improves finish and effective strength of core.

SHELL SANDS

dry bonded or liquid coated

Used by pioneers and recommended by leading resin producers. Fills popular capacity range . . . yet can be used for other jobs in shop. Effective mulling is the real answer to binder segregation problems.

SPECIAL MIXES

CO^2
Asphalt Base
Sulphate
Liquors
Silicates
Gums

Spring loading arrangement permits adjustment of effective muller pressure to fit job at hand. Users report Porto-Muller ideal for use on new CO^2 formulas.

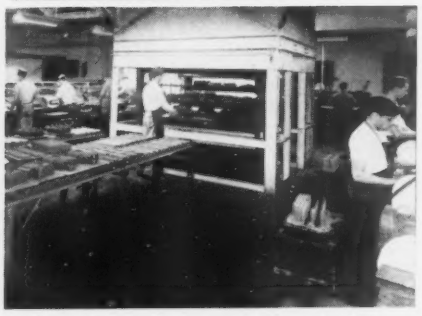
HERE'S A NEW BULLETIN ON THE PORTO-MULLER
It's just off the press . . . shows dimensions, specifications and testimonial reference. Write for your copy today!

National Engineering Company

646 Machinery Hall Bldg. • Chicago 6, Illinois

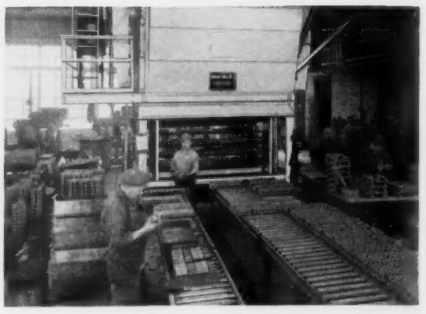
COLEMAN TOWER® OVENS

preferred for continuous core baking



Patented Open Center permits close, efficient grouping of coremakers around the oven . . . results in increased coremaker productivity.

3-way loading feature increases accessibility 300% over ordinary vertical oven designs.



Recuperative cooling system "smokes-off" and cools the cores before they reach unload station.

INCREASE PRODUCTIVITY

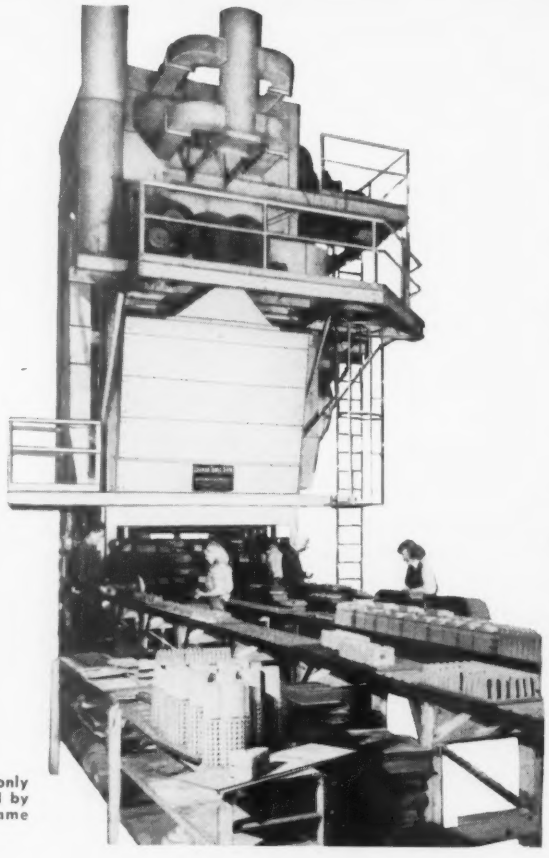
Savings through consistent, dependable production of perfectly baked cores; eliminating rejects, makeovers and casting losses due to improper core baking.

SAVE SPACE

Vertical design permits savings of approximately 75% of floor space over batch ovens of the same capacity. Cores are "smoked-off" and cooled before leaving unloading station.

REDUCE MAINTENANCE

Heavy duty construction for continuous, dependable performance and economical operation reduces maintenance cost to a minimum.



Coleman Tower ovens use only 25% of floor space required by batch type ovens of same capacity.

SAVE TIME

Cores of widely different sizes and shapes can be handled at the same time, all baked with consistent uniformity. Trucks, racks and money-wasting handling methods are eliminated.

SAVE BINDER

Proper core baking atmosphere and uniform temperature provide sizeable savings in conventional or high speed binders.

SAVE FUEL

Heat recovered from cores is used again, thus yielding important fuel saving. The most economical fuel available to you can be conveniently used.

• Coleman Tower Ovens are the most widely used continuous core baking ovens in the foundry industry. They have brought the advantages of mechanization to large and small foundries and have made important cost reductions. Why not find out whether Coleman Tower Ovens can bring the same savings to you? Our engineers are available without obligation to make practical recommendations for your particular requirements . . . call or write today!

WRITE FOR BULLETIN 54

A COMPLETE RANGE OF TYPES AND SIZES

for every core baking and mold drying requirement:

Tower Ovens • Horizontal Conveyor Ovens
Car-Type Core Ovens
Car-Type Mold Ovens
Transrack Ovens • Rolling Drawer Ovens
Portable Core Ovens
Portable Mold Dryers
Dielectric Core Ovens

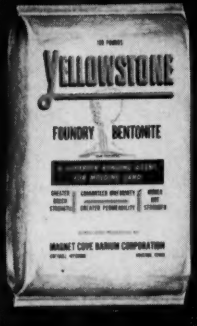
THE FOUNDRY EQUIPMENT COMPANY
1821 COLUMBUS ROAD CLEVELAND 13, OHIO

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

YELLOWSTONE

BENTONITE

for the best casting results



When you really want the best casting results Yellowstone Bentonite is your answer. Complete uniformity is guaranteed because Yellowstone is 100% pure Wyoming bentonite. Due to selective mining, there is a stockpile of 200,000 tons of the finest colloidal bentonite and this bentonite is processed in the world's most modern bentonite plant at Greybull, Wyoming.

Test after test proves Yellowstone Bentonite to have greater green strength and higher permeability. Because of this great strength and superior bonding characteristics, only small amounts of Yellowstone Bentonite and water are needed to temper.

Ask your distributor for Yellowstone Western Foundry Bentonite.

TYPICAL CHEMICAL ANALYSIS OF YELLOWSTONE WESTERN BENTONITE:

	%		%
Moisture	6.64	CaO	0.64
Combined Water	5.90	MgO	1.53
SiO_2	59.92	Na_2O	2.06
Al_2O_3	19.78	K_2O	0.57
Fe_2O_3	2.96	pH in water suspension	9.2

MAGNET COVE BARIUM CORPORATION

ONE OF THE DRESSER INDUSTRIES

HOUSTON, TEXAS

Imperial INNERLOCKED* Belts have won top position handling hot foundry sand in The McNally Pittsburgh Foundries, Inc., plant, built in 1945.

On the conveyor shown above, an Imperial Super-Insulated Sahara Belt (80′ x 24″ x 6-ply) carries searing, sizzling shakeout sand so hot it requires the heat-resisting capacity of Imperial's 600° belt.

Best for foundry service. Many foundries throughout this country and Canada use only Imperial belting on their "hot" conveyors and elevators. Experience has shown this heavy-duty canvas belting with its exclusive INNERLOCKED* stitching and superior heat-resistant impregnating compounds lasts much longer than lesser belts.

Asbestos layers withstand temperatures to 600°F. For protection from severe impact and abrasion, metallic reinforcement is available at no extra cost.

Job-designed belting. Whatever your needs, there is an Imperial Belt job-designed to give you lowest ultimate belt cost and highest day-to-day operating satisfaction. Write for Data Sheet 54-2 which describes Imperial Belts for foundry service.

**INNERLOCKED—Reg. trade name of Imperial Belting Co.*

Imperial BELTING CO.

1755 S. Kilbourn Ave., Chicago 23, Ill.

You expect MORE from Imperial . . . and you get MORE!

With the EDITORS

FOR BETTER SERVICE: Editors are worriers, and much of the worry concerns the problem of constantly improving the service of the publication to its readers. Here on the ninth floor of the Penton Building, down by the shores of Lake Erie, we spend a lot of time discussing ideas and plans to bring you the types of material that should help produce better castings at a lower cost.

In all of this planning, we need to know what our readers think of present efforts and what they may want in the future. Of course, we see many of you at meetings and conventions, we visit many foundries in the course of the year, and we hear from many of you by mail or over the telephone. All of these contacts are fine, and we do appreciate greatly the help they develop.

But we also need information beyond what we can gather ourselves. Therefore, we have a contract with the Eastman Research Organization of New York to provide reports of confidential information for our guidance. Eastman sends its staff of highly skilled interviewers to plants of readers to gather a large volume of information on the things in FOUNDRY you like, the things you did not care so much about, and the things you would like to see emphasized in the future. These data go to New York where the Eastman organization analyzes them and prepares a report of two large volumes covering reader performance.

The time required for the interviewer to secure this needed information from a reader is considerable. To those who have co-operated through the Eastman organization in the past by giving us the benefit of your experience and thinking, the editors wants to express real appreciation. You have helped us a lot.

We do hope that readers approached in the future will take the time for an interview.

And because you may never be tapped for an interview, why not drop us a note giving your ideas on how a better service job may be accomplished?

—o—

Fine Character: An issue of "Silicate P's & Q's" published monthly by the Philadelphia Quartz Co., Public Ledger Building, Philadelphia 6, carries an interesting tribute to one of the fine men who years ago presided over the activities in a college foundry. The tribute, which follows, introduces a discussion on the carbon dioxide-sodium silicate reaction:

Most people can look back on their school days and recall at least one teacher who stands out from others because of certain pronounced traits or eccentricities. Old John Sawin was such a man. He presided over the college foundry, one of a series of "shops," where for a semester student engineers were required to spend eight hours a week learning basic procedures of foundry operation.

It was a brilliant autumn morning when we first peered into the murky atmosphere of the vine-covered red brick building that housed John Sawin's domain. The interior walls had once been whitewashed, but long since had become heavy with dust, and only bits of white flakes could be seen here and there. The windows, too, were darkened with grime. At one end of the room was the great cupola where scrap metal and pig iron were melted; a smaller melting pot for brass and aluminum stood alongside. Back of it, to complete the picture, was a core oven.

Piled along the walls were great stacks of sectional frames or "flasks" in which sand is rammed around a pattern to form a mold for casting the metal. Heaps of fine black molding sand stood on the irregular brick floor. Numerous wooden patterns of simple castings such as manhole covers or grills for storm sewers, hung in racks on the walls. Overhead a few bare electric bulbs gleamed dimly.

The foundry would have been a dull, gloomy uninviting place in which to work except for the fact that it was bossed by a stocky, gnarled, grey-haired man who could only be labelled as a character. One of his amusing peculiarities was that he always referred to himself as "Old John," as though "I" and "me" were not a part of his vocabulary. "Give Old John that shovel," he would command, or "Old John wants you to listen carefully."

And listen we did, for Old John talked almost constantly. He seemed to become greatly excited on slight provocation and a dozen times a day he would erupt at the stupidity of his boys. He never cursed but he could turn on at will the most spectacular display of colorful language that most of the students had ever encountered. It was startling, even frightening, at first, but we were soon aware that the vocal violence of Old John never quite hid the twinkle in his mild blue eyes and it became evident, as time went on, that his apparent vituperations were only a dramatic way of emphasizing a point. With most teachers such a technique would have been absolutely fatal. With Old John, it was exciting, amusing and effective.

At the end of the term, as we checked out, the sentimental old curmudgeon literally patted each boy on the shoulder and sincerely urged him to drop in for a visit from time to time during the succeeding terms. It

CYCLONE CRUSHED STEEL

the new steel for bonding and other specific metal finishing

SPECIAL SPECIFICATIONS

1 – High Carbon
2 – High Hardness
3 – Fast Cleaning
4 – Long Life
5 – Low Cost

A knowledge of metal cleaning and abrasives is gained by metallurgical training and experience with different types of blast cleaning and peening.

An abrasive will, or will not do jobs under certain conditions.

Standard Abrasive Sales Engineers are trained in the application of abrasives and shall be glad to counsel with you as an abrasive user, concerning cleaning practice, cost reducing, improving finish, and expanding output.

Standard Abrasive has a complete line of blasting abrasives, and a Standard Engineer is able to assist you with your blasting problems. His services are yours without obligation.

The Spring Steel Abrasive

STANDARD ABRASIVE CO.

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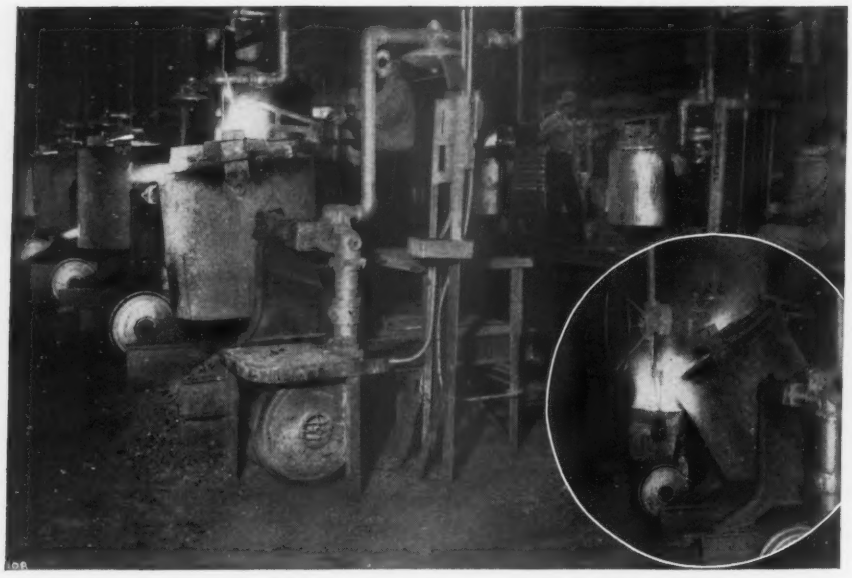
ANN ARBOR, MICHIGAN



do's and don'ts of good melting practice AT MAY CASTINGS CONGRESS

- Get your copy of *The Do's and Don'ts of Good Melting Practice for Non-Ferrous Foundries* in Booths 2101-03 at the May Castings Congress and Show, Atlantic City.
- Our exhibit will not only show representative crucible melting furnaces for non-ferrous metals ...gas and oil fired...but will present an educational effort which we hope you will find constructive.
- Write for our recommendations for *Hausfeld* Furnaces to cut your present melting costs and for bulletins on any non-ferrous melting job to THE CAMPBELL-HAUSFELD CO., 300-320 Moore Street, Harrison, Ohio.

Hausfeld

METAL MELTING FURNACES

was snowing hard as we left the foundry for the last time but the fine stinging flakes driven by an icy north wind at subzero temperature did not chill the warm, glowing feeling left by Old John. He had taught us a lot and the elements of foundry operation were not all that we had learned from this colorful teacher.

—o—

Note from Retirement: A note from LeRoy M. Sherwin indicates that he is thoroughly enjoying himself since retiring as superintendent of the foundry and wood and metal pattern shop of Brown & Sharpe Mfg. Co. on Jan. 1, 1953. He is spending his

winters at Whittier, Calif., but returns to his home at 85 Ferncrest Ave., Edgewood, R. I. for the summers. LeRoy studied at Rhode Island University and took courses at Harvard and Brown Universities. In his active foundry days he was with the Herron Pump & Foundry Co., Chattanooga; American Ship Windlass Co., Providence; General Electric Co., Pittsfield, Mass.; Central Foundry Co., Newark, N. J., and Raritan Radiator Co., Raritan, N. J.

I first met him in the early thirties when we were members of a Joint Committee on Education in Engineering Schools, which was organized by the AFS with representatives from the trade associations in the foundry and related industries. He was also active on other AFS committees, served as president of the New England Foundrymen's Association, was a member of the Technical Committee of GIFS and was otherwise active for the betterment of the industry. His boys at Brown & Sharpe won foundry and pattern apprentice contests many times.

Am sure he would enjoy hearing from old friends.

—o—

Never Done Before: Clement J. Freund, dean of engineering, University of Detroit, but still a foundryman at heart, commented the other day that "The engineer of the future will not be a man who can do things because he has done them over and over; he will be a man who can do things which he has never done before." Foundries, as they become more complicated, will need such men. F.G.S.

← ***Low operating cost***—Cores made with RCI's FOUNDREZ 7600 resin binder are baked *fast and economically* in this dielectric oven. The cost per ton of labor, materials and fuel is low . . . production rate high.

High core quality — RCI's FOUNDREZ 7600 resin binder permits efficient combinations of sand-cereal-resin and water for cores with low breakage and superior uniformity. Core drier plates are made with RCI FOUNDREZ 7500 . . . a powdered phenolic shell molding resin. ↓

faster core production

other advantages too, with

FOUNDREZ 7600

RCI's liquid water soluble urea-formaldehyde core binder

● FOUNDREZ 7600 core binder and the dielectric oven shown here do a great job together. They cut baking cycles from hours to minutes! But you don't need to operate with a dielectric to benefit from using RCI's FOUNDREZ 7600 resin. With a conventional core oven you can also speed production dramatically!

You can get more cores through a drier with a given heat input; or, if you prefer, *save fuel* by drying the same number of cores with a lower heat input.

FOUNDREZ 7600 also permits flexibility in core formulation . . . makes it easy to vary such properties as green strength, collapsibility, permeability and hardness. You get the best core for each metal — copper, brass, bronze, aluminum, magnesium, gray iron, cast iron or steel alloys.

Reichhold can deliver this liquid resin to you in tank car or tank truck lots (or, at higher price, in non-returnable 55-gal. drums).

Write to RCI for *Technical Bulletin F-2* which gives the many mix variations obtainable with FOUNDREZ 7600 core binder.

Creative Chemistry . . .
Your Partner in Progress

RCI

REICHHOLD

Synthetic Resins • Chemical Colors • Industrial Adhesives • Plasticizers
Phenol • Formaldehyde • Glycerine • Phthalic Anhydride
Maleic Anhydride • Sodium Sulfite • Pentaerythritol • Pentachlorophenol

REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N. Y.

This Simplified Design Will Cut YOUR PIG CASTING COSTS!

Bailey

PIG CASTING MACHINES

Drastically reduced maintenance costs result from the Bailey "stationary wheel" design, which eliminates 80% of the moving parts of ordinary pig casting machines. In this design roller bearing idler wheels are mounted on the frame rather than on the moulds, thus keeping them far as possible away from hot metal.

These machines are used in the casting of ferrous and non-ferrous pigs and ingots.

WILLIAM M. Bailey COMPANY
ENGINEERS
LEADERSHIP THROUGH QUALITY
1221 BANKSVILLE ROAD PITTSBURGH 16, PA.

CALENDAR of Meetings

Mar. 7-8—Foundry Educational Foundation, college-industry conference, Hotel Cleveland, Cleveland.

Mar. 12-16—National Association of Corrosion Engineers, annual conference, Hotel Statler, New York.

Mar. 19-20—Steel Founders' Society, annual meeting, Drake Hotel, Chicago.

Apr. 3—Material Handling Institute, spring meeting, Edgewater Beach Hotel, Chicago.

Apr. 3-4—Industrial Truck Association, spring meeting, Edgewater Beach Hotel, Chicago.

Apr. 9-11—American Institute of Mining and Metallurgical Engineers, national open hearth conference, Netherland Plaza Hotel, Cincinnati.

Apr. 12-13—Malleable Founders' Society, annual market development conference, Edgewater Beach Hotel, Chicago.

Apr. 18-19—Armour Research Foundation, Illinois Institute of Technology, national industrial research conference, Hotel Sherman, Chicago.

May 3—Non-Ferrous Founders' Society, annual business meeting, dinner and reception, Marlborough-Blenheim Hotel, Atlantic City, N. J.

May 3-9—American Foundrymen's Society, annual convention and exhibition, Convention Hall, Atlantic City, N. J.

May 9-11—American Welding Society, spring meeting and 4th welding and allied industry exposition, Buffalo.

May 9-19—Mechanical Handling Exhibition & Convention, Earls Court, London.

May 10-11 — Refractories Institute, annual meeting, Grand Hotel, Point Clear, Ala.

May 20-23—Industrial Heating Equipment Association, spring meeting, The Homestead, Hot Springs, Va.

May 24-25—Malleable Founders' Society, technical and operating conference, Wade Park Manor Hotel, Cleveland.

June 5-8—Material Handling Institute, exposition, Cleveland Public Auditorium, Cleveland.

June 11-12—Malleable Founders' Society, general meeting, The Homestead, Hot Springs, Va.

June 17-22—American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

June 24-26—Alloy Casting Institute, annual meeting, The Homestead, Hot Springs, Va.

July 17-30—Materials Handling Training Conference, Lake Placid, N. Y.

Sept. 1-9—Association of German Foundrymen, International foundry exhibition and trade fair, Dusseldorf, Germany.

Sept. 11-13—American Die Casting Institute, annual meeting, Edgewater Beach Hotel, Chicago.

Sept. 17-21—Instrument Society of America, instrument-automation conference and exhibit, Coliseum Bldg., New York.

Sept. 24-25—Steel Founders' Society of America, annual fall meeting, The Greenbrier, White Sulphur Springs, W. Va.

Sept. 24-26—Material Handling Institute, fall meeting, The Greenbrier, White Sulphur Springs, W. Va.

Oct. 4-5—Magnesium Association, annual meeting, Drake Hotel, Chicago.

Oct. 11-12—National Foundry Association, annual meeting, Detroit.

Oct. 18-20—Foundry Equipment Manufacturer's Association, annual meeting, The Greenbrier, White Sulphur Springs, W. Va.

Oct. 20-23—Conveyor Equipment Manufacturer's Association, annual meeting, The Greenbrier, White Sulphur Springs, W. Va.

Oct. 29-30—Refractories Institute, fall meeting, The Homestead, Hot Springs, Va.

Oct. 30-Nov. 2—Gray Iron Founders' Society, annual meeting, The Homestead, Hot Springs, Va.

Nov. 26-30—Third International Automation Exposition, New York Trade Show Bldg., New York.

"For 14 Years We've Tested Core Oils But None Have Ever Compared to Cities Service"

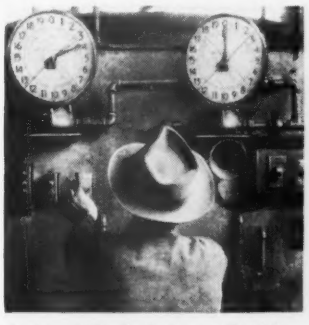
"For 14 years, people have been trying to show us what they felt was a better core oil," says Ralph Melick, Core Room Supervisor of Clio Foundry, Inc.

"And we've listened and looked with open minds—because if there's a better core oil around, we naturally want to know. But never in the past 14 years have we seen *any* core oil that compares with Cities Service Delco #36.

"Delco #36 has all the features we look for in a core oil. Uniformity from order to order . . . low gas content . . . good collapsibility . . . and the quick-drying ability so important to any foundry's production.

"These factors are all the more important when you consider that since 1940 we've had to boost our melting capacity from about one ton a day to 50 tons per day. Under these conditions, we needed perfection in a core oil—and we're happy to say we got it with Delco #36."

Each year, Cities Service receives an increasing number of foundry reports such as this—all praising Cities Service Delco Core Oils. If you'd like to learn the reasons, talk with your Cities Service Lubrication Engineer—the man who's specially trained to help you find the particular kind of core oil for your particular problems. Or, if you prefer, write Cities Service Oil Company, 20 N. Wacker Drive, Chicago 6, Ill.



Automatic Mixing Machine meters every drop of oil and water used to prepare sand for cores. Clio also uses electronically controlled gas ovens; has boosted daily melting capacity from 1 to 50 tons since 1940.

Core and Casting—another job well done. Clio makes numerous types of castings, including "high pressure" castings for the agricultural and automotive fields. They use Cities Service Core Oil exclusively.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

Want to really cut cleaning room costs?

switch to

CINCINNATI

PD

Snagging Wheels

IF YOUR cleaning room costs are slicing deep into your profits, switch to CINCINNATI (PD)° SNAGGING WHEELS—the greatest grinding wheel development in years! CINCINNATI (PD) WHEELS will absolutely cut your cleaning room costs . . . saving you money four important ways:

- LONGER WHEEL LIFE—Through longer life of CINCINNATI (PD) WHEELS, users have reported almost *double* the production per wheel. One customer, using a portable grinder, gets almost *twice* the life with a CINCINNATI (PD) Flared Cup. Another user, snagging cylinder blocks on a swing frame, has increased the production per wheel *45%* with (PD) WHEELS.

- FREER CUTTING—You can get more pounds of metal per hour with the grains and bonds specified by Cincinnati for your jobs. Operators like the fast, easy cutting action of CINCINNATI (PD) WHEELS.

- SELF-DRESSING ACTION—The CINCINNATI (PD) WHEELS specified for your job by Cincinnati abrasive engineers require few, if any, dressings. With the right grade wheel, new cutting grits are bared as soon as old grits get dull and inefficient.

- POSITIVE DUPLICATION (PD)—"On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

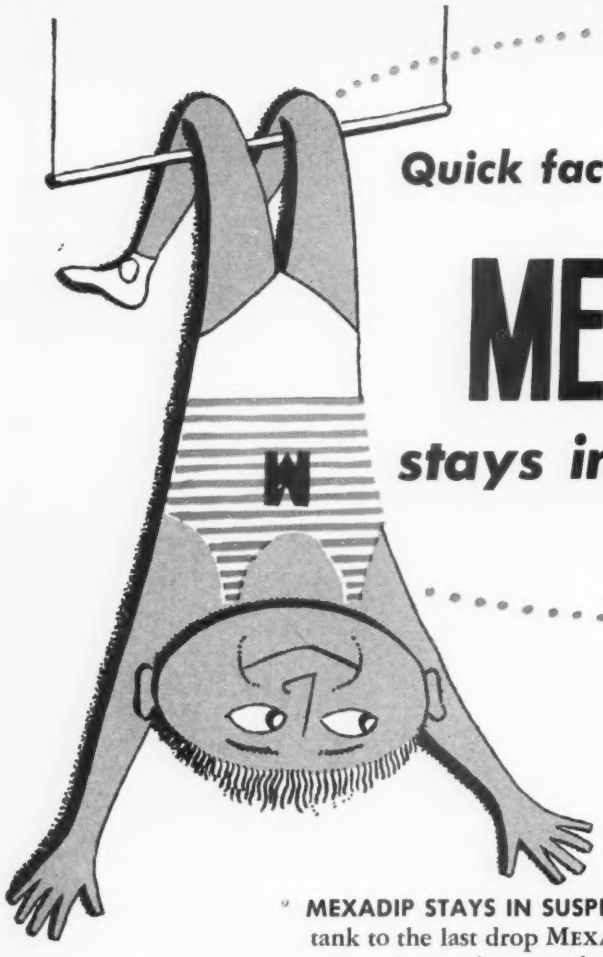
CINCINNATI (PD) WHEELS are made in vitrified and resinoid bonds for both ferrous and non-ferrous foundries and are available in a complete variety of sizes and shapes. *Yet these better, cost-cutting* CINCINNATI *(PD)* WHEELS *are priced no higher than ordinary wheels.*

We'll be happy to prove to you how CINCINNATI (PD) WHEELS can increase your production and cut your cleaning room costs. Just contact us and we'll send one of our representatives. Wire, write or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

CINCINNATI°
Grinding Wheels

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.



Quick facts for foundrymen . . .

MEXADIP®

stays in suspension!

- **MEXADIP STAYS IN SUSPENSION.** From full tank to the last drop MEXADIP stays in suspension at the same desired Baume. Let it stand over the week end, it will be ready to go Monday morning.
- **MEXADIP WILL NOT RUN, BUILD UP OR RUB OFF.** It applies equally well on either green or baked cores.
- **MEXADIP WILL NOT FERMENT.** You will not have to dump your wash because of hot humid conditions—no pock marks or pitted coating surfaces with MEXADIP.
- **MEXADIP IS DEPENDABLE AT ANY BAUME.** It is applied daily to cores for thousands of tons of castings over a range of 10-40 degrees Baume.
- **MEXADIP REQUIRES NO LONG "PASTE" MIXING.** No waiting period is necessary. Just add the powder to water and after a few minutes of stirring it is ready to go.

IMPROVE CASTING APPEARANCE AND SAVE MAN HOURS IN THE CLEANING ROOM. If you have a problem with core wash, MEXADIP will solve it. Ask us to arrange a test today.

Write for free illustrated Engineering Bulletin No. 17 giving detailed information about the complete line of Core and Mold Washes, made by The United States Graphite Company.

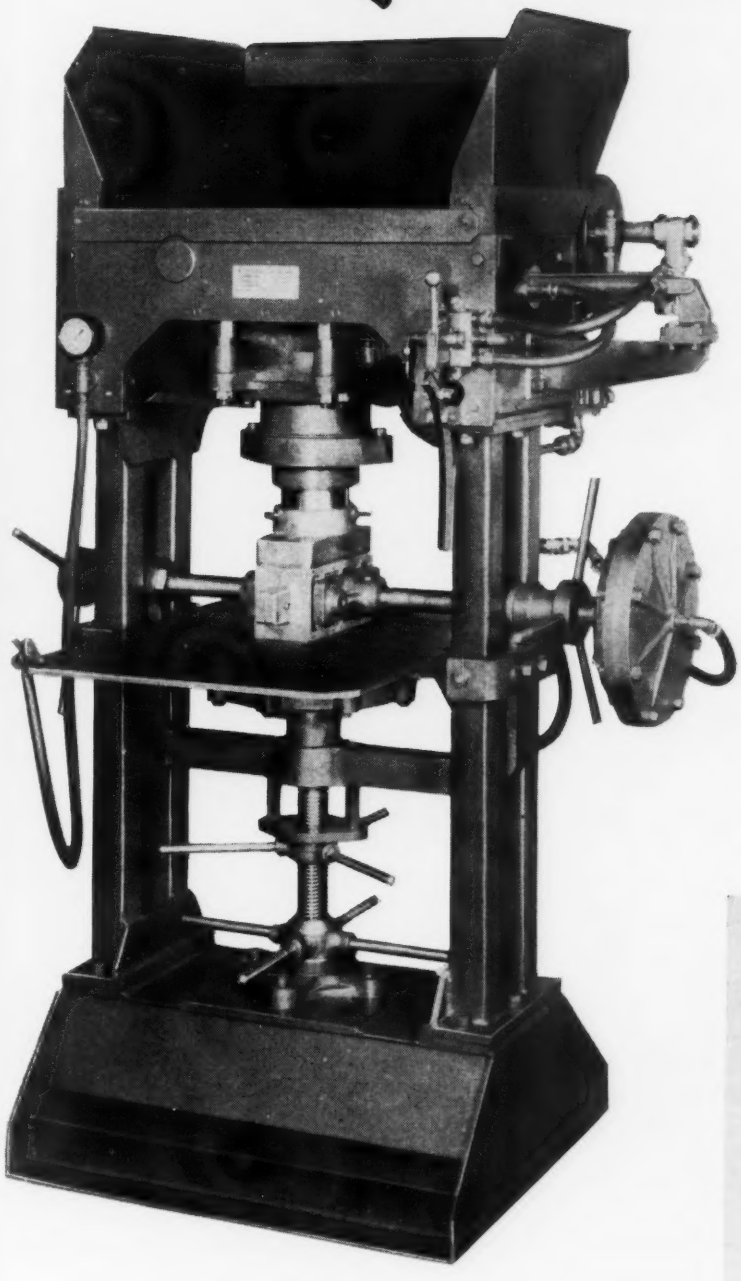
MEXADIP®

213

THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN

Redford NO. 4 CORE BLOWER



Designed to add more power, capacity, and speed to traditional Redford simplicity, flexibility and convenience, the No. 4 Redford superbly fills the need for a truly fast and flexible machine to blow cores from a few ounces to 10 lbs.

There is no need for the operator to wait for the machine at any time — the fast operating cycle permits immediate release of the core box after the cores have been blown.

Exhaust air is utilized to thoroughly fluff the sand remaining in the sand magazine after each blow, thus reducing the possibility of cratering.

Magazine heads normally furnished with the No. 2 Redford machine can be used with the No. 4 Redford. Larger new type magazine heads are also available as standard equipment.

A completely new fully adjustable clamp for vertically parted core boxes simplifies core box set up — when not needed the clamp units can be adjusted all the way out or completely taken off the machine.

Redford No. 4 users report production up to 8 boxes per minute using only one core box per machine. To get complete information write for Specification Bulletin 4.

Cores at right illustrate wide range of work that can be done with the Redford No. 4 Core Blower.

Redford IRON & EQUIPMENT CO.

20733 GLENDALE AVENUE • DETROIT 23, MICHIGAN • PHONE: KENWOOD 1-8611

R. Hoe & Co., Inc., Specifies Chateaugay Pig Iron for

INCREASED STRENGTH, BETTER MACHINABILITY

When a modern printing press operates at full speed, tons of metal parts get into action in precise relationship to each other. . . within tolerances closer than the thickness of the paper being printed. As a result, press design must provide both enormous strength and extreme accuracy.

For these reasons, R. Hoe & Co., Inc., New York, insists on Chateaugay, Republic's exclusive premium pig iron, for castings used in their complete line of printing presses.

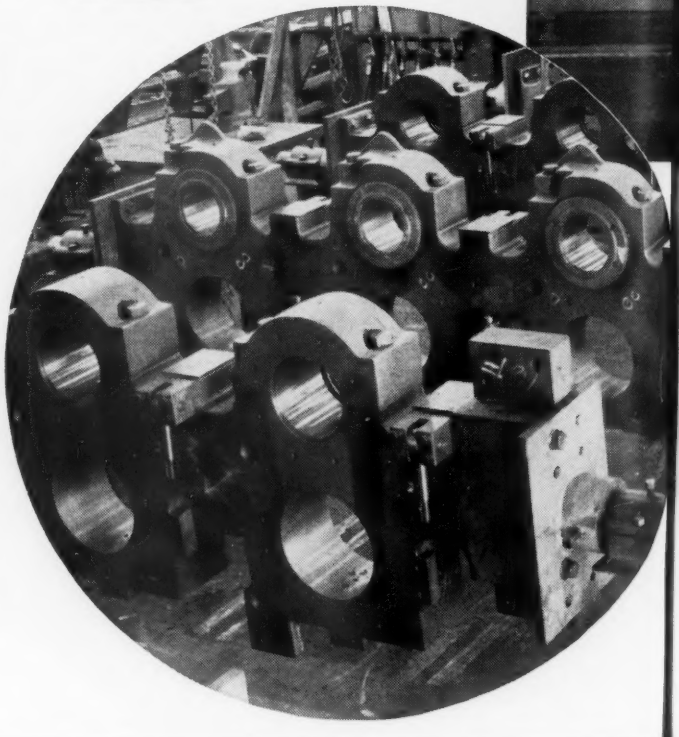
In order to maintain firsthand control of quality, Hoe operates its own foundry and machine shop at Dunellen, New Jersey. Here they have gained extensive working experience with Chateaugay in producing a wide variety of press parts. They find it gives them the strength they need, plus fine grain structure which makes for better machinability . . . the foundation for precise operation of the completed press.

Chateaugay offers superior characteristics which make it ideal for many current applications. It promotes uniform metal structure, which results in improved tensile strength and internal quality of castings. It improves wear-resistance and provides exceptionally good machined finish.

Consider all of these advantages in terms of your own production . . . and call in a Republic Pig Iron Metallurgist. He can assist you in determining your best applications for low-phosphorous, copper-free Chateaugay Pig Iron. Simply mail the coupon, today.

UNIFORM MACHINABILITY of Chateaugay Pig Iron pays off in the planing operation shown right. Here, many multi-color press side frames are machined simultaneously.

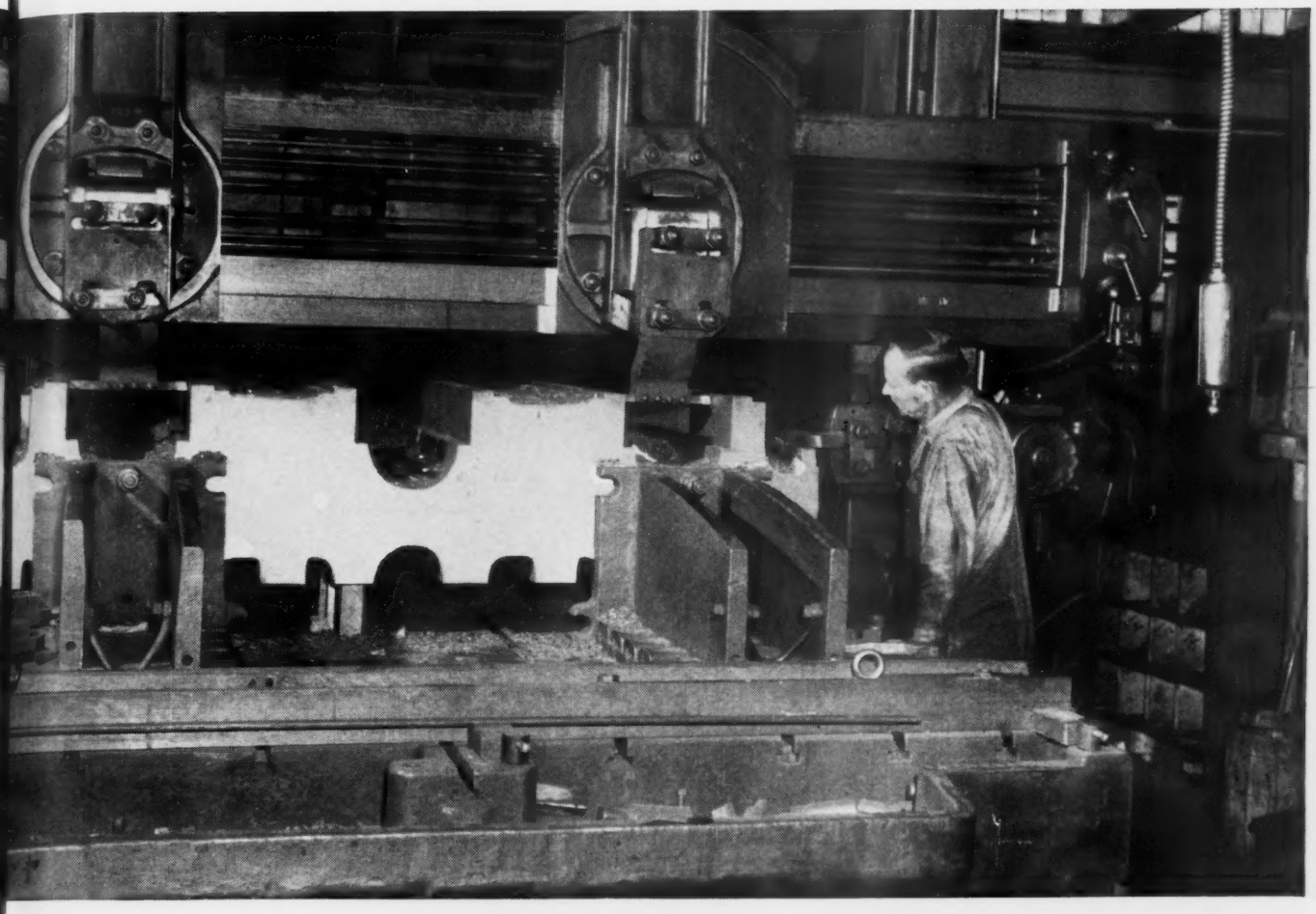
CHATEAUGAY'S GREAT STRENGTH is an important factor in the design of these magazine press side frames. R. Hoe and Co., Inc., also specifies Chateaugay for bed plates, ink rails, paper roll arms, housings, brackets, columns, braces, cylinders and other vital cast parts.



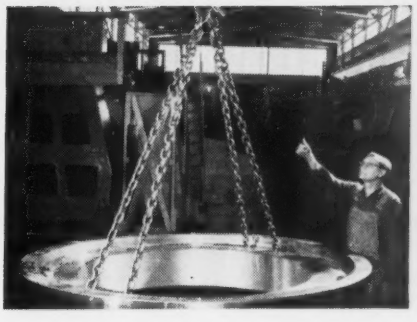
REPUBLIC

REPUBLIC STEEL

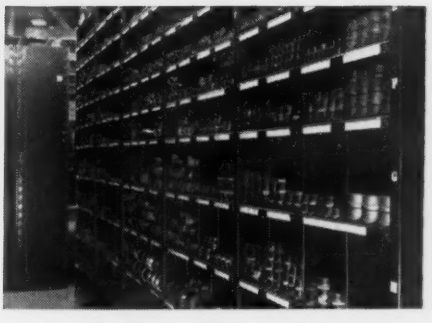
World's Widest Range of Standard Steels



STRENGTH MEANS DURABILITY in Republic's complete line of Materials Handling Equipment. For example, these PB-130 Box and Skid Units are equipped with stacking brackets and tiering lugs. Their durable, ribbed construction permits high stacking, freeing maximum floor space for production equipment and materials' movement. For information on entire line, mail coupon.



STRENGTH MEANS SAFETY when you specify Republic Chain Products. No matter what your production or product application, Republic can furnish the right chain and accessories from a selection including electric welded, fire welded, and weldless types in high carbon, low carbon, wrought iron or alloy analyses. Send coupon for literature.



STRENGTH MEANS EFFICIENCY in storing a wide variety of parts, when you use Republic Wedge-Lock Steel Shelving. Joints are designed to grow tighter as load increases, permitting higher stacking without distortion or instability. Result is efficient use of floor space plus easy rearrangement to meet changing conditions. Mail coupon below for additional information.

STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
Dept. C-1383
3132 East 45th Street
Cleveland 27, Ohio

☐ Please have a Pig Iron Metallurgist call

Please send further information on:
☐ Chain Products ☐ Steel Shelving
☐ Materials Handling Equipment

Name_____

Address_____

City_____ Zone____ State_____

CONSISTENT QUALITY . . .
Not Perfection

Pays Off for Both Foundryman and User

● Absolute *perfection* in castings is usually a pointless aim. It is also expensive and seldom necessary.

It is *consistent* quality that designers and engineers need, with the 10,000th casting as useful as the first. For any selected level of service requirements, you set the standard and hold to it. This is profitable and builds acceptance for castings.

Cooperation between the foundryman and user of castings can develop good design. Castings that are lighter, stronger and cheaper can usually be produced.

With Magnaflux' fast, low-cost non-destructive inspection methods, *all* cracks in any metal can be found and evaluated. Many cracks are unimportant, while some will call for corrective action. You thus can eliminate the needless scrapping of *good* castings for *seeming* defects that have no effect on service. Causes of any really serious defects can be corrected. Magnaflux, Magnaglo, Zyglo and Stresscoat are profitable tools in the foundry.

To insure consistent, reliable castings, once right procedures have been established, only a sampling "finger-on-the-pulse" inspection is normally required.

● *Ask to Have a Magnaflux Engineer Give You All the Facts—Soon*

MAGNAFLUX CORPORATION

MAGNAFLUX CORPORATION

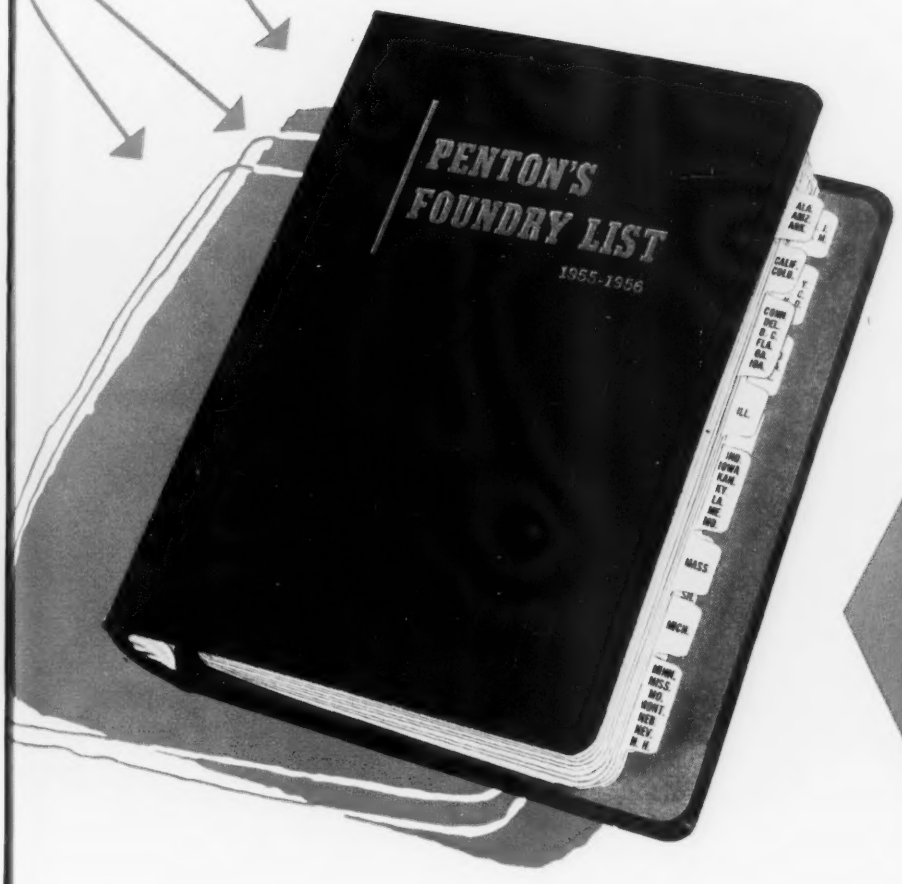
7350 West Lawrence Ave. • Chicago 31, Ill.

New York 36 • Pittsburgh 36 • Cleveland 15
Detroit 11 • Dallas 19 • Los Angeles 58

New Foundry List

now available

for immediate delivery.



Who? Where?

Metals Melted?

Melting Equipment & Capacity?

Departments Operated?

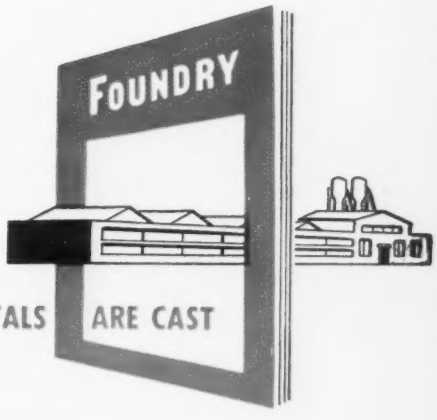
Casting Methods?

• For many years, FOUNDRY has conducted an intensive census of the foundry industry in the United States and Canada . . . every two years, basic information on all foundries is published in *Penton's Foundry List and Directory.*

The 1955-56 Edition of PFL is now available. It gives comprehensive information on all of the 6,208 metal casting plants in the U. S. and Canada. It tells who they are and where they are located; what metals they melt, their melting equipment capacities, and departments operated.

Well-indexed, and in loose-leaf form, PFL is useful to casting buyers and foundry suppliers. For prompt delivery, write: Book Department, FOUNDRY, 1213 West Third St., Cleveland 13, Ohio.

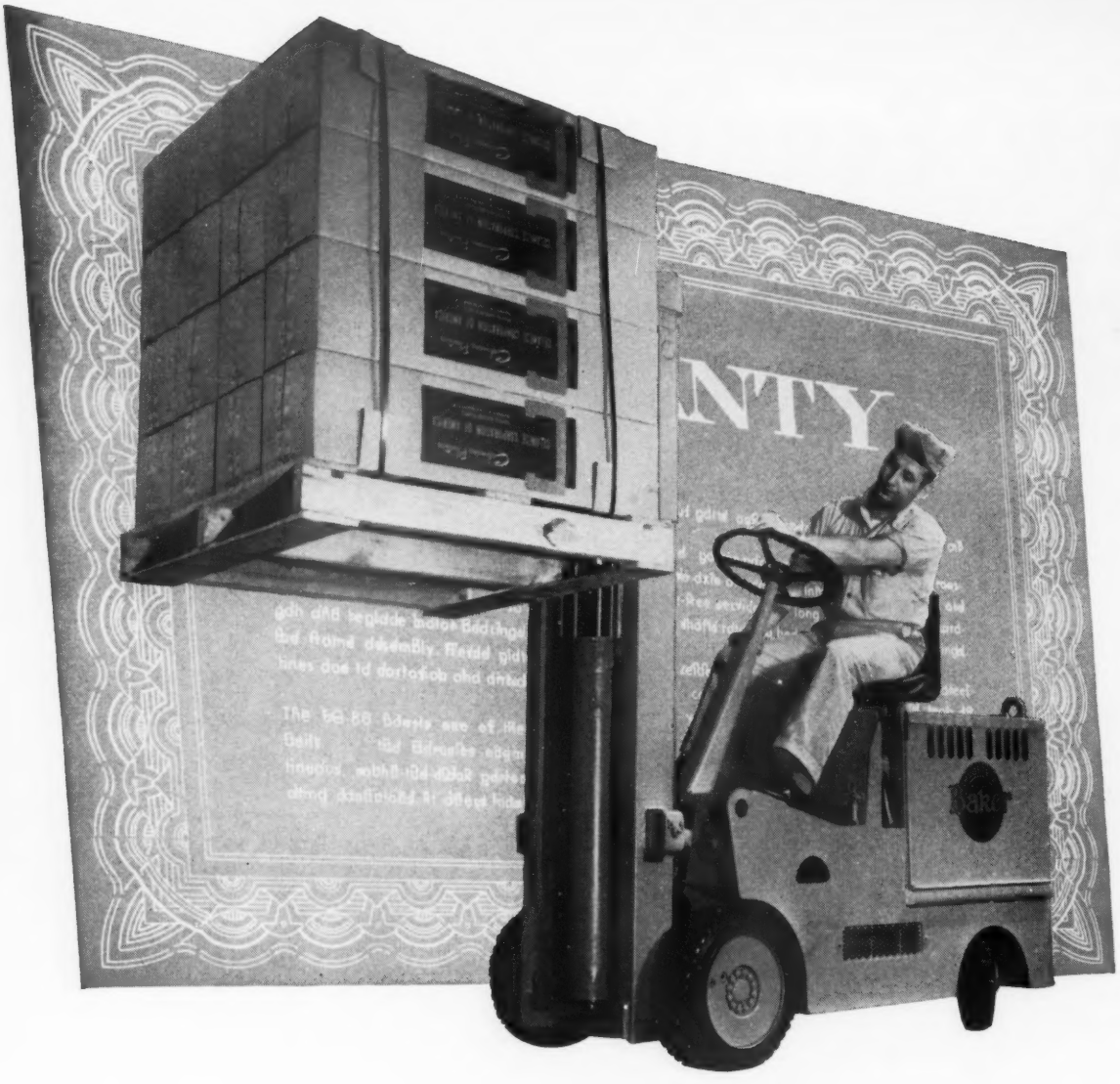
PRICE: $100 PER COPY
orders now being taken for immediate delivery.



Serving Foundrymen

WHEREVER METALS ARE CAST

A PENTON PUBLICATION, PENTON BUILDING, CLEVELAND 13, OHIO



Insist on a...

ONE YEAR WARRANTY

when you buy an electric fork truck

All Baker battery-powered industrial trucks—including fork, platform, crane trucks and tractors—are warranted against defects for a full year from date of shipment.

As a truck purchaser, you should accept nothing less.

A one-year warranty assures you that the manufacturer has complete confidence in the materials and workmanship that go into his product. It gives you twelve months protected operation of the truck *under your conditions*—allowing ample time to detect imperfections, which might not show up during a 30, 60 or 90 day guarantee period.

Baker Trucks have a half-century reputation for outstanding performance, long life and low maintenance. For example: a fleet of the first Baker ram trucks ever built is still in service at a large midwestern steel mill after 32 years!

Let a Baker handling engineer give you the full story, or write for Bulletin 54B. The Baker-Raulang Company, 1223 West 80th Street, Cleveland 2, Ohio.

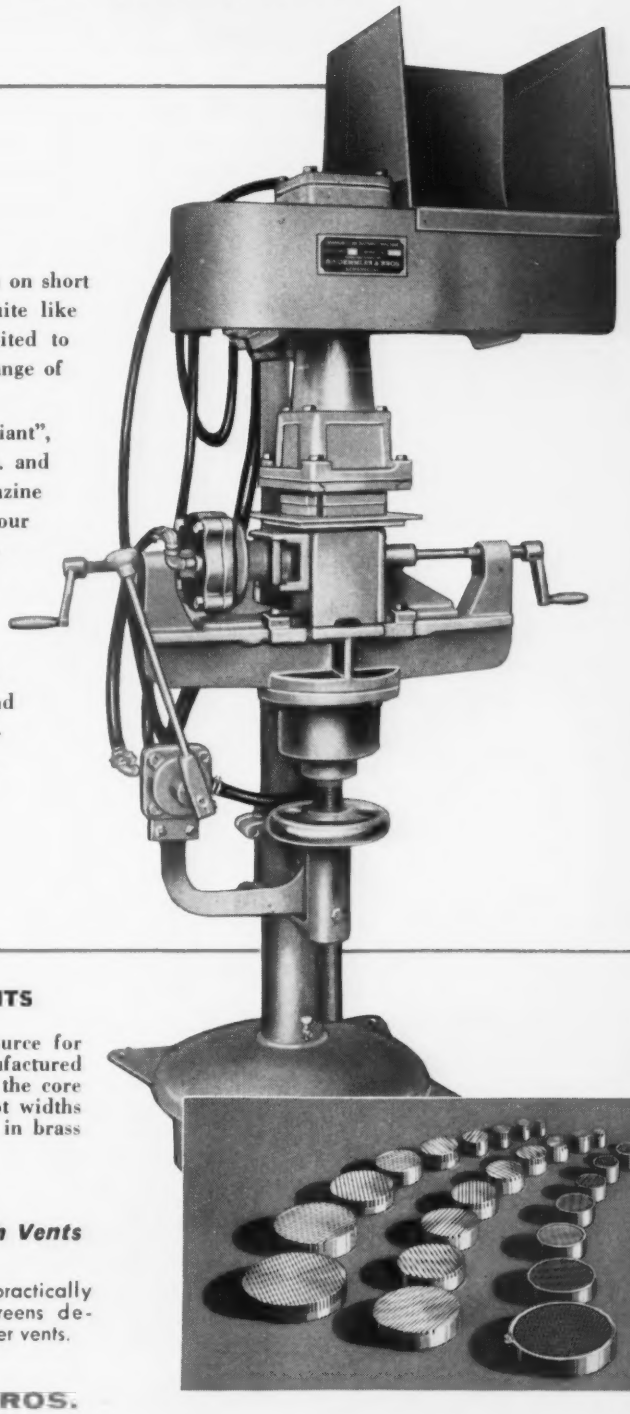
Subsidiary of Otis Elevator Company

Baker®
handling equipment

5E2

DEMMLER

The Oldest Name in Core Blowers



the DEMMLER 55

For fast, economical production on short job runs, there's no machine quite like the DEMMLER 55 — so well suited to your needs at a cost within the range of any foundry.

Accurately called "the Little Giant", the 55 handles cores up to 4 lbs. and has a wide range of sand magazine bottom openings to meet all your core box dimensional requirements. It is used for core boxes with depths up to 10".

The DEMMLER 55 has one hand-valve operating both vertical and horizontal core box clamps and blows the core in 3 seconds maximum. It's simple, rugged and requires virtually no maintenance.

PRECISION CORE BOX VENTS

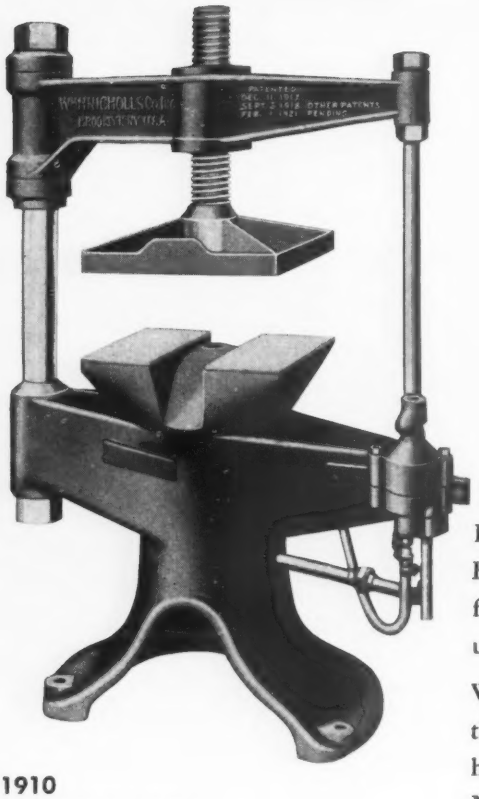
Demmler is by-far your best source for precision core box vents, manufactured by specialists who pioneered in the core blower industry. Many sizes, slot widths and screen meshes are available in brass and steel core box vents.

NEW *HL* ***150 Mesh Vents***

A new general purpose vent which practically eliminates the cleaning courser screens demand. Write for literature on Demmler vents.

WM. DEMMLER & BROS.

KEWANEE, ILLINOIS



1910
molding machine

For 46 Years

FIRST

in Molding Progress

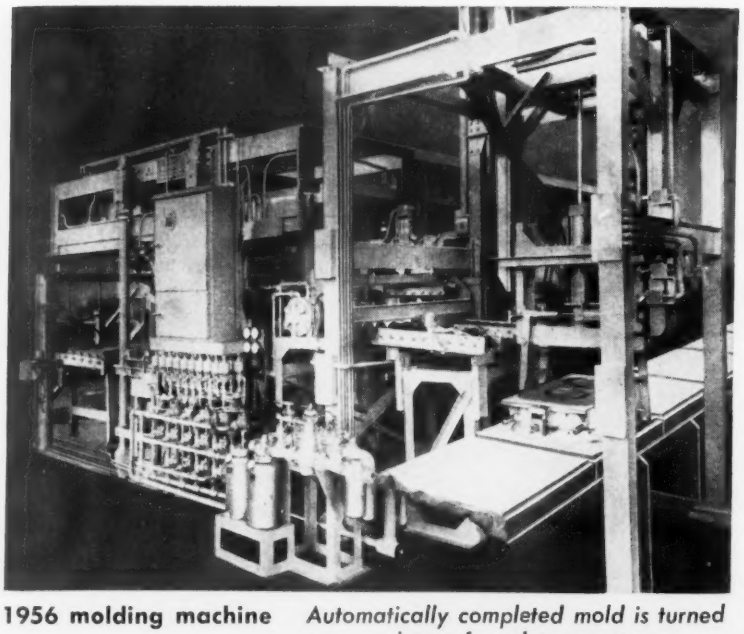
Forty-six years of research and highly skilled engineering have made WM. H. NICHOLLS & CO., molding and foundry equipment leaders in their field. This half century of creative experience has led to an unparalleled understanding of your foundry requirements.

With todays industrial standards the highest in the world—you'll find that whatever your requirements, NICHOLLS' builds just the precision heavy duty . . . molding machine to meet those needs perfectly. All NICHOLLS machines are famous for their quality performance . . . reliable operation . . . and economical service.

So whatever the molding job, be it large, small, manual or automatic, remember you can depend on NICHOLLS to give finer molds *continuously* at lower cost!

Always rely on "Nicholls" for the best in heavy-duty molding machines

Wm. H. Nicholls Co., Inc.,
Richmond Hill 18,
Long Island, N. Y.



1956 molding machine *Automatically completed mold is turned over and transferred to conveyor*

NICHOLLS

GAMMA
sources
equipment
containers

TECHNICAL OPERATIONS, INC.

TO

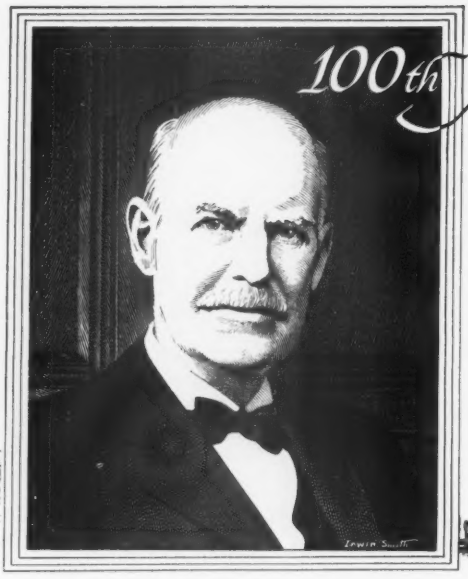
ANNOUNCEMENT

Picker X-Ray Corporation and Technical Operations, Inc. are pleased to announce that the equipment manufactured by Technical Operations for radiography with isotopes is henceforth to be distributed and serviced by Picker X-Ray Corporation. The Picker engineering and service organization now stands ready to serve you with a wide range of both *x-ray* and *isotope* equipment for industrial radiography. Inquiries may be directed to any local Picker office or to 25 South Broadway, White Plains, New York.

Wherever you are there's a Picker office somewhere near you in this network of sales and service facilities.

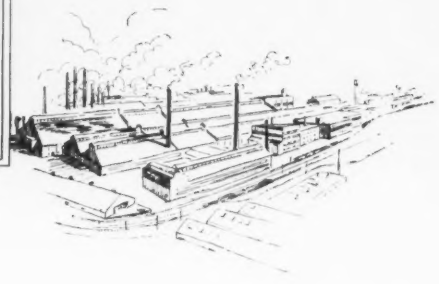
Picker
x-ray

X-RAY
equipment
maintenance
accessories
planning



100th Anniversary

INVENTOR
SCIENTIST
INDUSTRIALIST



this was genius . . .

EDWARD GOODRICH ACHESON

Yes, this was genius.

Thomas A. Edison knew it. In paying tribute upon the occasion of Doctor Acheson's passing, he said ". . . as a former associate I know the world loses a great genius."

Leo Hendrik Baekeland knew it. He remembered him "as a man who combined a most fertile brain with great strength of conviction."

Walter B. Pitkin knew it. This famous psychologist said "As he created his place in our civilization so does that place pass with him. None shall fill it."

And the press knew it. They used in their editorials such phrases as "world's acclaim of a genius," "one of the geniuses of his time," and "the loss of an inventive genius."

But what makes genius?

Employing a mixture of carbon, sand, salt, and sawdust in a simple but effective electric furnace, made up of a few strands of wire, a carbon rod, and a plumber's bowl, Edward Goodrich Acheson was able to bring into being a mass of scintillating crystals rivaling many gems in splendor and almost matching the diamond in hardness. These highly abrasive crystals he crushed and made into grinding wheels, and these wheels, in turn, were used to shape metals and make machines. Called "Carborundum" by Acheson and silicon carbide by the chemist, this new material did its job so well that it is credited with making possible today the mass production of automobiles, tractors, and countless other mechanisms.

Possibly silicon carbide could be made better—harder or sharper. To this end Acheson subjected silicon carbide to higher temperatures for longer periods; what he obtained was not a harder substance but, instead, one of the softest—pure graphite. The extreme conditions to which he had exposed his jewels of industry brought about their disintegration, the silicon passing off as vapor and the carbon remaining as a soft, unctuous residue. Manufactured graphite, destined to be of far-reaching importance, became another of Acheson's contributions to industry.

Unquenchable curiosity, coupled with the indomitable spirit that was his, led him to uncover means of preparing this new product of the electric furnace in the form of plates and cylinders. Put to work as electrodes, these soon revolutionized electrochemical and electrometallurgical operations. Acheson had now made commercially feasible the production of new families of chemicals and laid the groundwork for the present efficient manufacture of steel and alloys.

During Acheson's painstaking efforts to produce graphite crucibles he experimented with many clays for use as binding agents—and he learned much about them—so much in fact that he was able to explain why the ancient Egyptians used straw in their brick making and what caused the formation of the deltas of the Nile and Mississippi. Most important, he discovered a method of rendering graphite colloidal.

Colloidal graphite in modern industry plays a role that is varied and complex, its unique properties finding utility in such dissimilar fields as lubrication, electronics, metalworking, and lithography, to name a few. The techniques originated by Acheson for colloidally dispersing graphite are being applied to other solids including carbon blacks, pigments, and minerals.

To those of us in the companies identified with Doctor Acheson, his perseverance and achievement are an inspiration. We are proud to offer this tribute to his genius on the 100th anniversary of his birth.

Acheson Industries, Inc.

ACHESON COLLOIDS COMPANY
PORT HURON, MICH.

ACHESON DISPERSED PIGMENTS CO.
PHILADELPHIA, PA.

GREDAG, INC.
NIAGARA FALLS, N. Y.

ACHESON COLLOIDS LIMITED
LONDON, ENGLAND

For more information, use Reader Service Card, page 201

Manufacturer: **Midland** • *Shell Molder:* **King Industries** • *Product:* **Midland Tiller-Tractor**

Shell Molding Resin: **#47 Plenco**

These gears (illustrated actual size) are part of the differential assembly of the fine tiller-tractors made by The Midland Company, South Milwaukee, Wis.

In the former plaster casting method, the gears had to be set up in a turret lathe for boring and counter-boring the shaft holes. A recess had to be cut in the hub and the flat side of hub machined. In addition, the teeth around the ingate had to be shaped to size.

By using modern, shell molded castings made with Plenco #47 resin, King Industries, Milwaukee, was able to eliminate all these time and material consuming operations. The turret lathe was replaced by a drill press for one simple reaming operation—now the only finishing required on the shell-molded gears. *Result: a reduction of 40% of the previous machining costs.*

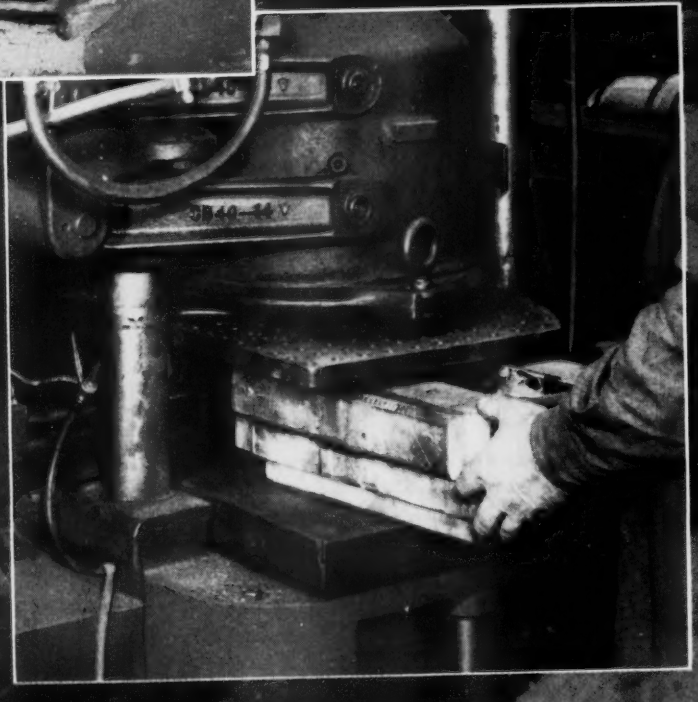
Other advantages of the shell-cast gears include better uniformity and tolerance control from lot to lot, so that inspection of incoming gears by the end-user has become a mere formality. Why don't you investigate the many economic and production advantages of shell molding with dependable, versatile Plenco resins?

PLENCO PHENOLICS
FOR BETTER PLASTIC PRODUCTS

PLASTICS ENGINEERING COMPANY
Sheboygan, Wisconsin

Serving the plastics industry in the manufacture of high grade phenolic molding compounds, industrial resins and coating resins.

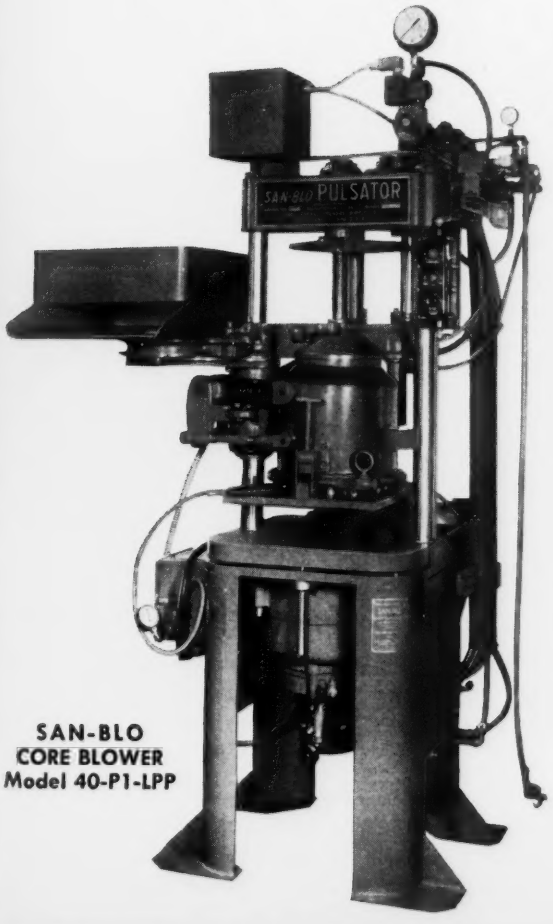
don't ram wooden boxes . . .



when you can blow them . . .

...but, will your present machines blow them? SAN-BLO WILL!

The SAN-BLO Core Blower, with low pressure prefill and pulsator type blow, is the only Core Blower designed and recommended for blowing wooden as well as metal core boxes!



SAN-BLO CORE BLOWER Model 40-P1-LPP

Now you can have all the advantages of high speed core blowing for *wooden core boxes, TOO!* Because the SAN-BLO will blow high quality cores in the same boxes* you're now ramming—blow them *safely*... with *negligible* core box wear... with *minimum,* (if any) rigging. Here's why:

SAFETY PULSATOR TYPE BLOW consists of 2, 3 or 4 short, quick, ramming blows—rather than the conventional, continuous blow. *Prevents* dangerous pressure build-up within the core box during the blowing cycle ... *eliminates* the possibility of blowing core box apart.

WEAR LOW PRESSURE PREFILL "riddles" a layer of fluffed sand on the bottom of the core box, *before* full ramming pressure is automatically cut-in. *Eliminates* the sand blasting or gouging of the bottom of core box, during the blowing cycle.

RIGGING Federal's new UNIVERSAL, QUICK-CHANGE, BLOW AND VENT PLATE ASSEMBLY *is standard equipment* on all Pulsator model SAN-BLO machines. Blow plates for open-top boxes can now be made up in *less than 10 minutes time,* at a cost of but a *few dollars,* and can be changed on the machine in a *matter of seconds.* Further, since a majority of existing wooden core boxes are open-top, the universal vent plate generally eliminates the necessity of inserting vents in core boxes. As a result, the blowing of short-run cores becomes as economical as production runs.

MORE SAN-BLO FEATURES: "Cyclo-Air" sand chamber with motor-driven agitator and aerating air circuit ...adjustable sand chamber height...air-oil-controlled automatic draw...single-push-button control... wooden and metal core boxes blown on the same machine... cores weighing from a few ounces to full capacity of machine blown with one sand chamber, at maximum blowing efficiency.

To learn more about blowing wooden core boxes safely, efficiently and economically... write our home office and request our representative to call.

* *Most existing wooden core boxes will withstand the clamping and blowing pressures developed by the SAN-BLO core blower.*

FEDERAL

San-Blo Division

The **FEDERAL FOUNDRY SUPPLY** *Company*

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FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

OFFICES IN CHICAGO DETROIT LOS ANGELES MILWAUKEE NEW YORK

SAND AND FLOUR

- Domestic and Australian zircon foundry sands
- Zircon foundry flours in 200 and 400 mesh particle sizes

Orefraction Inc.

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For more information, use Reader Service Card, page 201

Late News

HEADS BDSA BRANCH: Roger F. Waindle has been made chief, Castings Branch, Iron and Steel Division, Business and Defense Services Administration, Washington. He is on loan from his positions as vice president, Misco Corp., staff consultant, Consolidated Foundries & Mfg. Corp., Chicago, and president, WaiMet Engineering Co., Wagan, Mass.

SCRAP HEARING: Hearings on the controversial subject of how much iron and steel scrap the government should permit to be exported will be held in Washington, Mar. 6, by the House Banking and Currency Committee. A date for proposed hearings by the House Small Business Committee has yet to be announced.

JOINS NATIONAL: S. C. Massari, formerly technical director, American Foundrymen's Society, has been appointed director of research, National Engineering Co., Chicago. Recently he was manager, Foundry Division, Hansell-Elcock Co., Chicago. Mr. Massari will present the Charles Edgar Hoyt Memorial Lecture at the AFS Atlantic City convention.

LECTURE COURSE: Chicago Chapter, AFS, has scheduled a three-session lecture course in March. The program: Mar. 5, "Producing Quality Castings," by N. Levinsohn, foundry superintendent, Minneapolis-Moline Co., Minneapolis; Mar. 12, "Existing Foundry Processes and How To Improve Them," by H. H. Johnson, director of research, National Malleable & Steel Castings Co., Cleveland; Mar. 19, "Planning for the 20th Century Foundry," by R. F. Thomson, General Motors Corp., Detroit.

SAND CASTINGS LAG: Permanent mold and die casting processes dominated light metal foundry operations last year. Aluminum casting shipments rose 32 per cent to a record 416,000 tons. The gain in sand castings was a little over 8 per cent while permanent mold products rose 39 per cent and die castings jumped 45 per cent. Magnesium casting shipments increased nearly 10 per cent to 13,944 tons. A decline of 1 per cent in sand casting shipments was more than offset by gains of 22½ per cent in die castings and 32 per cent in permanent mold castings.

INORGANIC BOND: In the search for an inorganic sand bonding material that will produce a higher quality casting, Steel Founders' Society of America has contracted with Horizons Inc., Cleveland research and development specialists, to conduct research on the subject.

WHO BUYS WHAT? An expanded edition of *U. S. Government Purchasing Directory*, a guide to the government's military and civilian purchasing, has been published by the Small Business Administration. Listing 4000 classes of commodities covering the more than 5 million items the government buys, the directory is available for 50 cents from the Superintendent of Documents, U. S. Government Printing Office, Washington, 25.

CONTINENTAL FOUNDRY: M. G. Sternberg has resigned, for reasons of health, as vice president of Blaw-Knox Co. in charge of its Continental Foundry & Machine Division, East Chicago, Ind. He will continue as a consultant. H. A. Forsberg, Continental vice president, has been named manager of the division's three plants. James Thomson, for the last 25 years chief works engineer for Continental at East Chicago, has retired. He was with the company 39 years.

OBITUARY: Keith Williams, 66, vice president and general manager, Pratt & Letchworth Division of Dayton Malleable Iron Co., Buffalo, died there Feb. 15 . . . Albert Christensen, 81, president and founder, Christensen & Olsen Foundry Co., Chicago, died Feb. 18 . . . W. M. Reed, 63, founder and chairman, American Air Filter Co., Louisville, died in Ft. Lauderdale, Fla., Feb. 2 . . . William H. Bishop, pig iron salesman, American Steel & Wire Division, U. S. Steel Corp., Cleveland, died there Feb. 11 . . . John Cameron, 86, well known Scottish iron foundryman and past president and medalist of the Institute of British Foundrymen, died recently . . . Paul J. Froning, 69,

foundry superintendent, New Idea Farm Equipment Co., Coldwater, O., died Feb. 5.

PERSONALS: C. E. Wenninger, recently development engineer, National Engineering Co., Chicago, has joined Hydro-Blast Corp., Franklin Park, Ill., as technical director . . . Dr. James T. MacKenzie is retiring Apr. 7 as technical director, American Cast Iron Pipe Co., Birmingham . . . Elvin W. Day, with Ford Motor Co.'s manufacturing engineering office, Dearborn, Mich., has been named manager of the aluminum foundry Ford will build at Listerhill, Ala. . . . John A. Thomas, assistant plant manager of Perfect Circle Corp.'s piston ring foundry in Rushville, Ind., since operations started last September, has been made manager. Dallas Lunsford, acting plant manager there, has resumed full-time duties as chief metallurgist . . . John M. Allen has been appointed plant personnel director, Defiance Plant of Central Foundry Division, General Motors Corp. . . . L. M. Diran has been placed in charge of cast constructional steel developments, Development and Research Division, International Nickel Co.

MISCELLANY: Pittsburgh Lectromelt Furnace Corp., Pittsburgh, has become a division of McGraw Electric Co., Elgin, Ill. . . . C & S Products Inc., Detroit 27, has been formed from C & S Products Co., a partnership. Officers of the company, shell blowing machine manufacturer and shell process consultants, are Gerald A. Conger, Chris A. Zanison and Rodney L. Sonnenberg . . . Engineered Precision Casting Co., Matawan, N. J., is celebrating its tenth anniversary this year . . . Simplicity Engineering Co., Durand, Mich., maker of shakeouts and other material handling equipment, is expanding its plant with a 50,000-sq-ft addition . . . Malleable Founders' Society is completing the program for its annual Market Development Conference to be held at Edgewater Beach Hotel, Chicago, Apr. 12-17 . . . Royer Foundry & Machine Co. has appointed Indiana Products Co., Kokomo, to handle its sand handling and conditioning equipment in Indiana, Michigan and western Kentucky. . . Acheson Colloids Co., Port Huron, Mich., will celebrate on Mar. 9 the 100th anniversary of its founder, Dr. Edward Goodrich Acheson.

Prices of Foundry Metals and Coke

(As of February 24, 1956)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$16.00-17.00
OVEN	
Birmingham	$25.65
Buffalo	27.50
Chicago	27.00
Detroit	27.50
Erie, Pa.	27.50
Indianapolis	26.75
Kearny, N. J.	26.75
Lone Star, Tex.	19.50
Milwaukee	27.50
Montreal, Que.	28.50
Neville Island (Pittsburgh)	26.25
New England, deld.	28.55
Painesville, O.	27.50
Philadelphia	26.50
St. Paul	26.50
Swedeland, Pa.	26.50
Terre Haute, Ind.	26.75

PIG IRON

(Per gross ton f.o.b. furnace)

	No. 2 Foundry	Malleable
Bethlehem, Pa.	$61.00	$61.50
Birmingham	55.00	....
Buffalo	59.00	59.50
Chicago	59.00	59.00
Cleveland	59.00	59.00
Duluth	59.00	59.00
Erie, Pa.	59.00	59.00
Everett, Mass.	65.00	63.00
Fontana, Calif.	62.50	....
Geneva, Utah	59.00	....
Granite City, Ill.	60.90	61.40
Lone Star, Tex	55.00	....
Neville Island (Pittsburgh)	59.00	59.00
Steelton, Pa.	61.00	61.50
Swedeland, Pa.	61.00	61.50
Toledo, O.	59.00	59.00
Troy, N. Y.	61.00	61.50
Youngstown, O.	....	59.00

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 42.00; tin bronze, No. 225, 56.00; No. 245, 48.75; high-leaded tin bronze, No. 305, 45.75; No. 1 yellow, No. 405, 33.25; manganese bronze, No. 421, 37.75.

ALUMINUM: 99 per cent plus primary ingots 24.40. Secondary No. 12 alloy 29.00 Deoxidizing grades: No. 1 29.75-30.25; No. 4 27.50-28.50.

MAGNESIUM: 99.8 per cent notched ingots 33.25, f.o.b. Freeport, Tex. (10,000 lb or more).

COPPER: Electrolytic 46.00 delivered Connecticut valley.

ZINC: High grade 14.85 delivered. Die casting alloy No. 3, 18.00 delivered.

IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$41.00-42.00	**$47.50-48.00	.....	.....	.....	.....	$63.00-64.00
Boston*	**38.00-39.00	**40.50-41.00	.....	.....	**42.00-43.00	.....	.....
Buffalo	46.00-47.00	**46.00-47.00	.....	.....	**49.00-50.00	.....	62.00-63.00
Chicago	46.00-48.00	46.00-47.00	.....	51.00-52.00	51.00-52.00	58.00-59.00	62.00-64.00
Cincinnati*	**45.00-46.00	**44.00-45.00	**42.00-43.00	.....	**54.00-55.00	.....	**65.00-66.00
Cleveland	49.00-50.00	54.00-55.00	46.00-47.00	53.00-54.00	55.00-56.00	59.00-60.00	69.00-71.00
Detroit*	**45.00	**43.00	**35.00	**46.00	.....	**42.00	.....
Los Angeles	42.00	**48.00	.....	.....	.....	.....	.....
New York*	41.00-42.00	43.00-44.00	45.00-46.00	.....	.....	.....	.....
Philadelphia	50.00-51.00	50.00	53.00	.....	54.00-55.00	68.00	.....
Pittsburgh	47.00-48.00	48.00-49.00	45.00-46.00	.....	53.00-54.00	.....	65.00-67.00
St. Louis*	40.50	47.00	38.00	48.00	.....	.....	66.00
San Francisco	40.00	50.00	36.00	50.00	50.00	.....	.....
Seattle	42.00	**40.00-43.00	**38.00	**40.00	.....	.....	.....

* Brokers' buying prices. ** F.o.b. shipping point

Whitehead's FINE SILICA SANDS

for Fine Finish Castings and Shell Molding

Whitehead offers the widest variety of fine washed and unwashed silica sands . . . all laboratory-tested in a Whitehead laboratory in each of the areas represented.

DIVIDING CREEK, New Jersey
Fine Washed Silica Sands

Retained on Sieve #	Grade D #71	Grade D Special #75	Grade E #96	Grade Overflow #118	Grade Superior #158
30	none	none	none	none	none
40	2.0	1.0	1.0	.2	.2
50	9.8	4.8	7.6	3.2	1.8
70	26.4	14.0	20.4	13.2	4.6
100	41.0	40.2	31.8	29.0	11.2
140	15.0	29.8	17.2	20.2	22.4
200	4.4	8.2	10.8	15.4	25.6
270	.8	1.2	5.6	8.8	14.0
Pan	.6	.8	5.6	10.0	20.2

McCONNELLSVILLE, New York
Fine Unwashed Silica Sands

Retained on Sieve #	#103	#130	#155	#180	#230	#275
30	.3	.2	none	none	none	none
40	.5	.2	.4	"	"	"
50	4.2	.4	1.4	"	.2	"
70	13.6	1.6	3.2	.4	.2	.2
100	26.1	12.4	10.2	2.5	.4	.6
140	25.7	32.8	22.0	18.0	4.0	1.2
200	20.8	37.2	30.0	35.9	21.4	6.4
270	5.5	9.8	14.2	17.4	21.4	11.2
Pan	3.3	5.4	16.8	23.8	46.4	80.4
Very Fine	none	none	1.8	2.0	6.0	

NEW ENGLAND
Marion Fine Washed Silica Sand AFSF #105

Sieve #	Retained
+6	none
12	"
20	"
30	"
40	.6
50	1.4
70	6.0
100	30.6
140	34.4
200	19.2
270	4.6
Pan	3.2

LEADER IN FOUNDRY SANDS SINCE 1841

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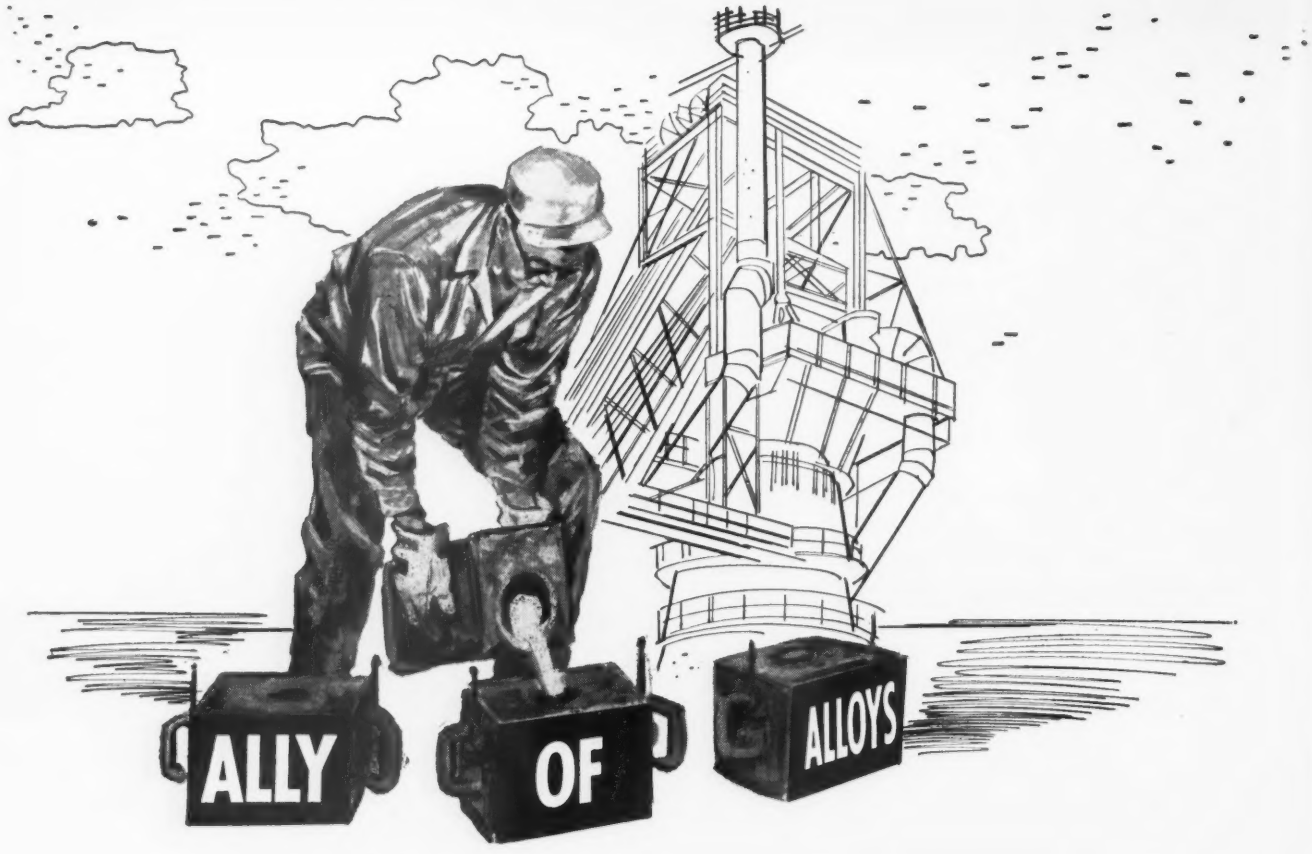
Ready-to-use core paste

DOB-IT
Ready-to-use core mudding compound

JOINT-SEAL
Plastic compound for perfect sealing

LYQUAFLOUR
For cleaner surface, better shakeout

LYQUAFACE
The liquid sand grain coating

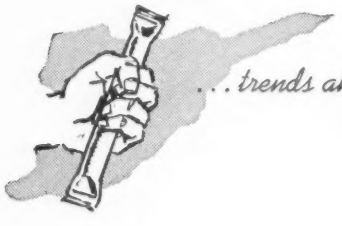


...the Miracle Metal ... LITHIUM

Lithium, like metallurgy, has come a long way. Once a laboratory curiosity, lithium is now the "catalyst of industry." Once the art of separating metals from their ores, metallurgy now embraces a whole new industry devoted to the manufacture and treatment of the alloys of these metals. And now—still another new field within a field—Lithium Metallurgy.

Lithium Ingots are used in the degasification of copper. Lithium Cartridges are used in the refinement of high temperature copper, and in brass, bronze and nickel-silver castings. Even the salts of lithium (Carbonate and Chloride, specifically) hold great promise for heat treating.

Lithium metal and its compounds could hold the same hope for *you*. We will be happy to discuss it at your convenience.



... trends ahead in industrial applications for lithium

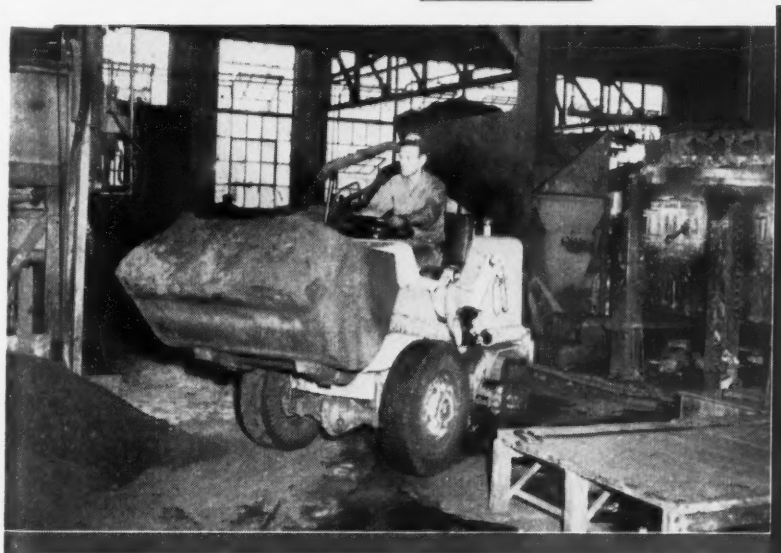
LITHIUM CORPORATION OF AMERICA, INC.
2600 RAND TOWER
MINNEAPOLIS 2, MINN.

MINES: Keystone, Custer, Hill City, South Dakota • Bessemer City, North Carolina • Cat Lake, Manitoba • Amos Area, Quebec • BRANCH SALES OFFICES: New York Pittsburgh • Chicago • CHEMICAL PLANTS: St. Louis Park, Minnesota • Bessemer City, North Carolina • RESEARCH LABORATORY: St. Louis Park, Minnesota

. . . "the **PAYLOADER**® came out way on top. the two HA's with roll-back buckets are doing better than ⅓ more work than machines without roll-back action."

(Signed) WILLIAM MCCAIN, *Foreman*
Ohio Stove Company
Portsmouth, Ohio

Best for your operations too!



. . . "believe the new model HA **PAYLOADER**® the best machine for our operations."

(Signed) E. F. STOLPE, *Owner*
Penna. Malleable Casting Co.
Lancaster, Pa.

Foundries and metal-working plants far and wide are expressing their satisfaction with the performance of the new-design model HA "PAYLOADER". Built to scoop-up and carry more material for its weight than any tractor-shovel near its class, the new HA is way ahead of the field in the *kinds* of work it can do — in the *amount* of work it can do.

Torque-converter drive; full-reversing transmission; 40-degree bucket tip-back at ground; closed, pressure-controlled hydraulic system with built-in shock absorber . . . these are but a few of the many tried and proven plus values in the new HA that contribute to its leadership in performance, low maintenance and long life. Your Hough Distributor is eager to show you what the new HA or a larger "PAYLOADER" can do for you.

PAYLOADER®
MANUFACTURED BY
THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.
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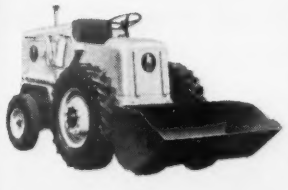

For higher lifts and more production a bigger front wheel drive unit — model HAH 1 cu. yd. capacity.

THE FRANK G. HOUGH CO.
703 Sunnyside Ave., Libertyville, Ill.

- ☐ Send data on Model HA (1⅛ cu. ft.)
- ☐ Send data on Model HAH (1 cu. yd.)
- ☐ On larger models up to 2 cu. yd.

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You Benefit from ELECTROMET'S

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Production * Service

For 50 years ELECTROMET has produced ferro-alloys and metals essential in the production of steel, iron, and non-ferrous metals. Research and development by ELECTROMET during these 50 years have provided the trade with new and better alloys and metals to meet specific needs. Increased emphasis on research and development promises continued benefits in the future.

The ELECTROMET story is one of steady growth and progress for the benefit of the metal industries. When you buy from ELECTROMET, you get the best in alloys and service plus the advantages of long manufacturing experience and extensive research.

Here are some of the advantages you get from ELECTROMET's *integrated programs.*

Competent Metallurgists and Sales Engineers

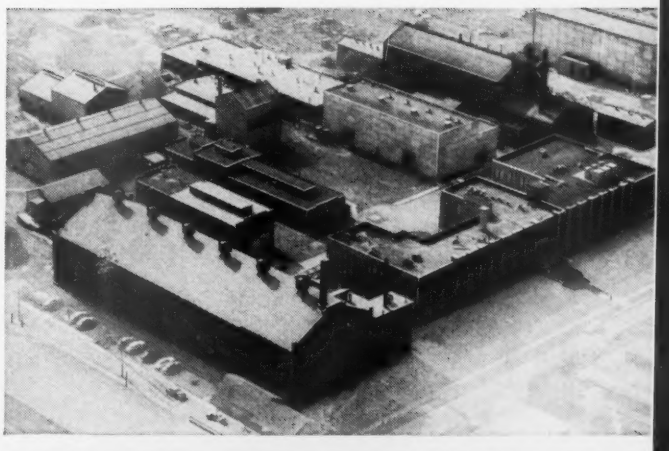
Nine sales and service offices are strategically located in the major steel producing centers as shown on the map above. If you have a problem on metals or alloys, let one of our experienced metallurgists or sales engineers help you. He will be glad to assist you with any problems on the production of quality steels, irons, and non-ferrous metals. Simply telephone or write the ELECTROMET office nearest you.

B Ca Cb Cr Mn Si Ti V W Zr

T's 50 Years of Experience

Continuing Research and Development

Since 1906 ELECTROMET has carried on a three-way program of research, development, and technical service. More than 300 skilled research scientists, engineers, and technicians work in ELECTROMET's Metals Research Laboratories and Development Laboratories at Niagara Falls (shown here). This program provides you with new ferro-alloys and metals, better ways of using them, and new and improved alloy steels and irons. Innovations are fully developed in our laboratories before they are offered commercially.



Wide Range of Alloys to Meet Your Needs

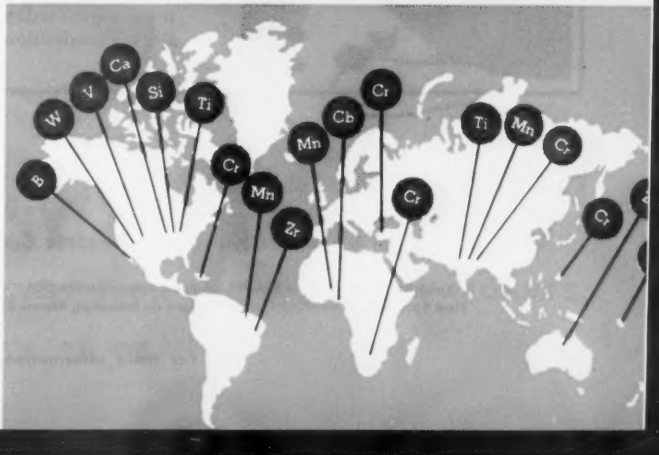
Over 50 different products are manufactured to meet the regular requirements of the metal industry as well as the special needs of customers. This wide range of high-quality ferro-alloys and metals is the result of 50 years of research, development, and service by ELECTROMET. ELECTROMET offers the widest selection of ferro-alloys and metals to meet your specific requirements.

Seven Modern Plants—4 With Own Power Facilities

Our plants have been greatly expanded and modernized to meet the current demands for ferro-alloys and metals. The recently completed plant at Marietta, Ohio, is the world's largest ferro-alloy plant. Company-owned power facilities at four of the plants assure a constant supply of power for efficient production. Prompt shipment of ELECTROMET ferro-alloys is assured from all seven plants, and from six warehouses conveniently located to serve you.

World Wide Ore Sources

The availability of ores, and other raw materials is assured by ELECTROMET's diverse facilities, including mines and ore milling plants owned by UNION CARBIDE. Helping to assure adequate ore supplies are the ore buying facilities of Union Carbide Ore Company, a Division of Union Carbide and Carbon Corporation. Ores come from the far corners of the earth to ELECTROMET's plants. On this simplified map of the world, symbols for the chemical elements indicate a few of the major sources of alloy ores.



ELECTRO METALLURGICAL COMPANY

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

OFFICES: Birmingham • Chicago • Cleveland • Detroit • Houston • Los Angeles
New York • Pittsburgh • San Francisco

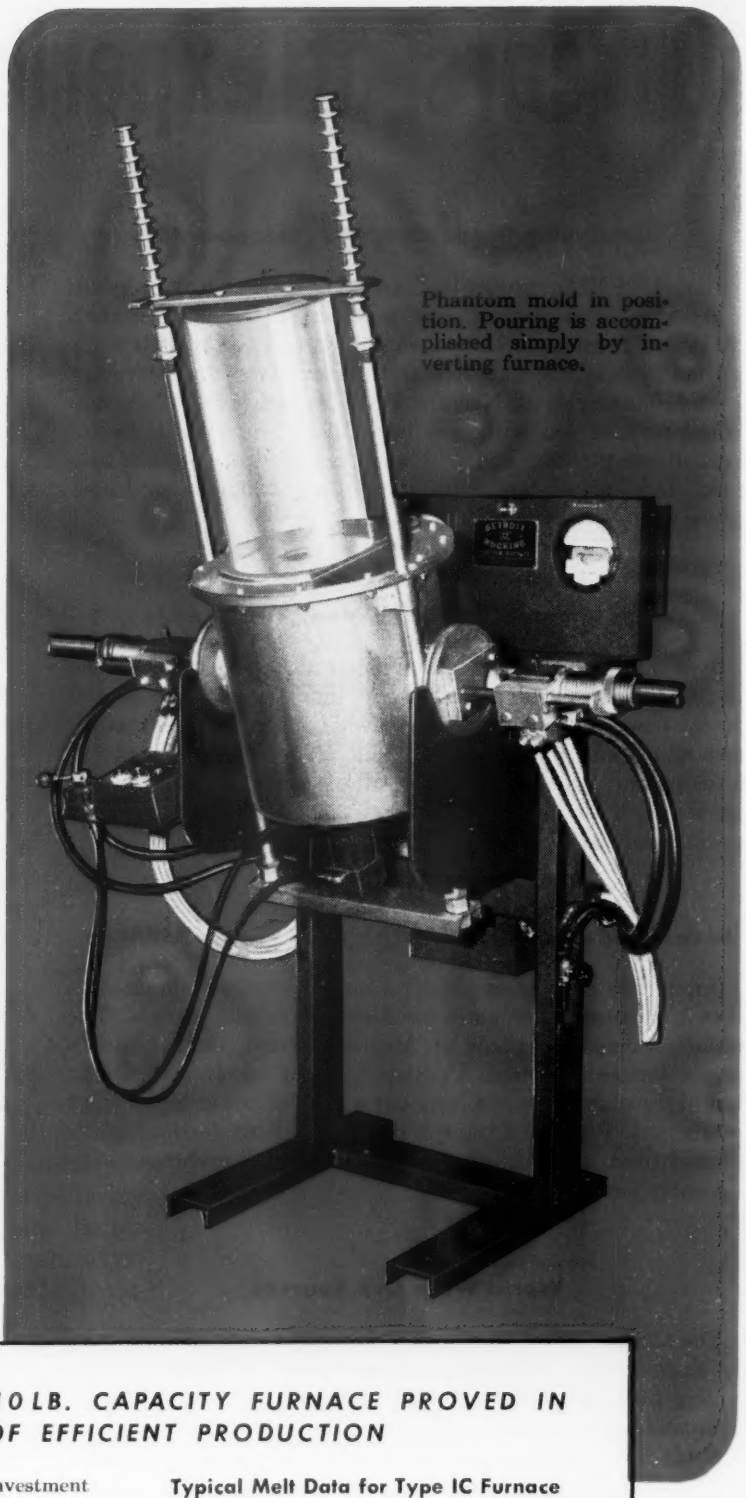
In Canada: Electro Metallurgical Company, Division of Union Carbide Canada Limited, Welland, Ontario

The term "Electromet" is a registered trade-mark of Union Carbide and Carbon Corporation.

a new, LARGER investment casting furnace...

THE 20 LB. CAPACITY, 20 KW., ID

Detroit Electric Furnace



Phantom mold in position. Pouring is accomplished simply by inverting furnace.

Now, a direct-casting, indirect arc furnace for precision parts up to 20 pounds. The new Detroit Electric ID Furnace melts metal quickly, holds precise analysis, operates with great economy. When metal is ready, mold is clamped on and the furnace is inverted to pour the mold without further handling.

For full information on this great, new investment casting furnace, write us today.

TYPE IC, 10 LB. CAPACITY FURNACE PROVED IN 3 YEARS OF EFFICIENT PRODUCTION

Faster, better investment castings! That's the record of the IC Furnace, producing precision parts on a continuous schedule in many plants today. A high-quality production furnace!

Typical Melt Data for Type IC Furnace

Metal	Wt. Charge	Average Melt Time	K.W.H./lb. Power Consumption
Stainless Steel	6 lb.	10 min.	.364
Steelite	5¾ lb.	9 min.	.340
Gray Iron	6 lb.	9 min.	.333
Copper	6 lb.	5 min.	.203
Yellow Brass	6 lb.	4½ min.	.179

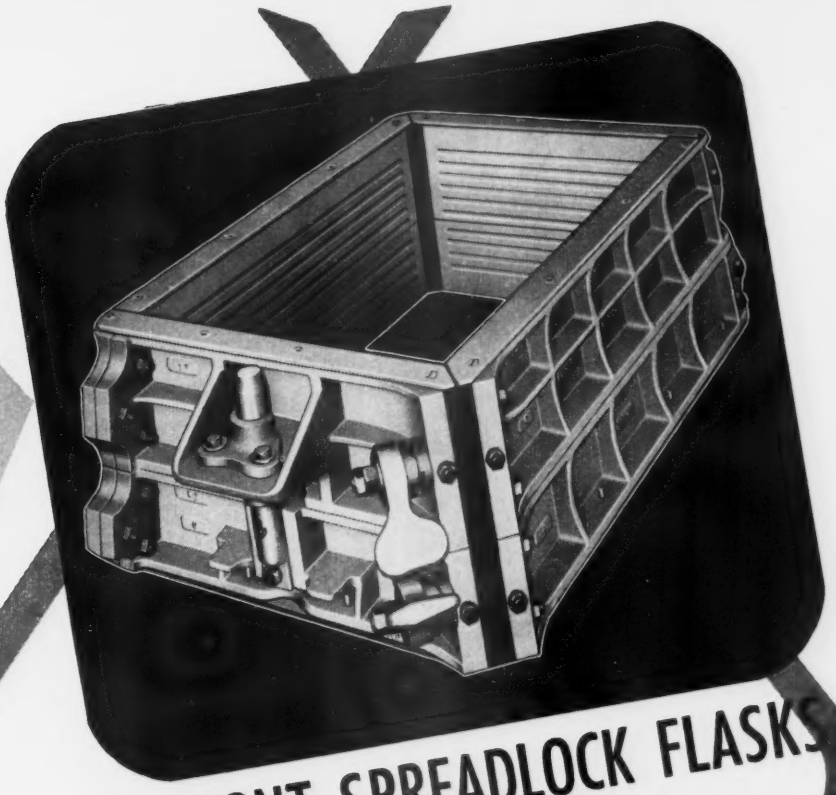
DETROIT ELECTRIC FURNACE DIVISION

Kuhlman Electric Company • Bay City, Michigan

Foreign Representatives: in BRAZIL—Equipamentos Industrias, "Eisa" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 7, N.Y.; MEXICO: Cia Proveedora de Industrias, Atenas 32-13, Apartado 27A3, Mexico 6, D.F., Mexico; EUROPE, ENGLAND: Birlec, Ltd., Birmingham.

SAND-FREE CORNERS

Corner gaps completely closed by long-life, replaceable live rubber inserts.



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PERFECT ALIGNMENT

guaranteed by one foolproof GROOVLOCK pin. Solid, bolted and welded corners.

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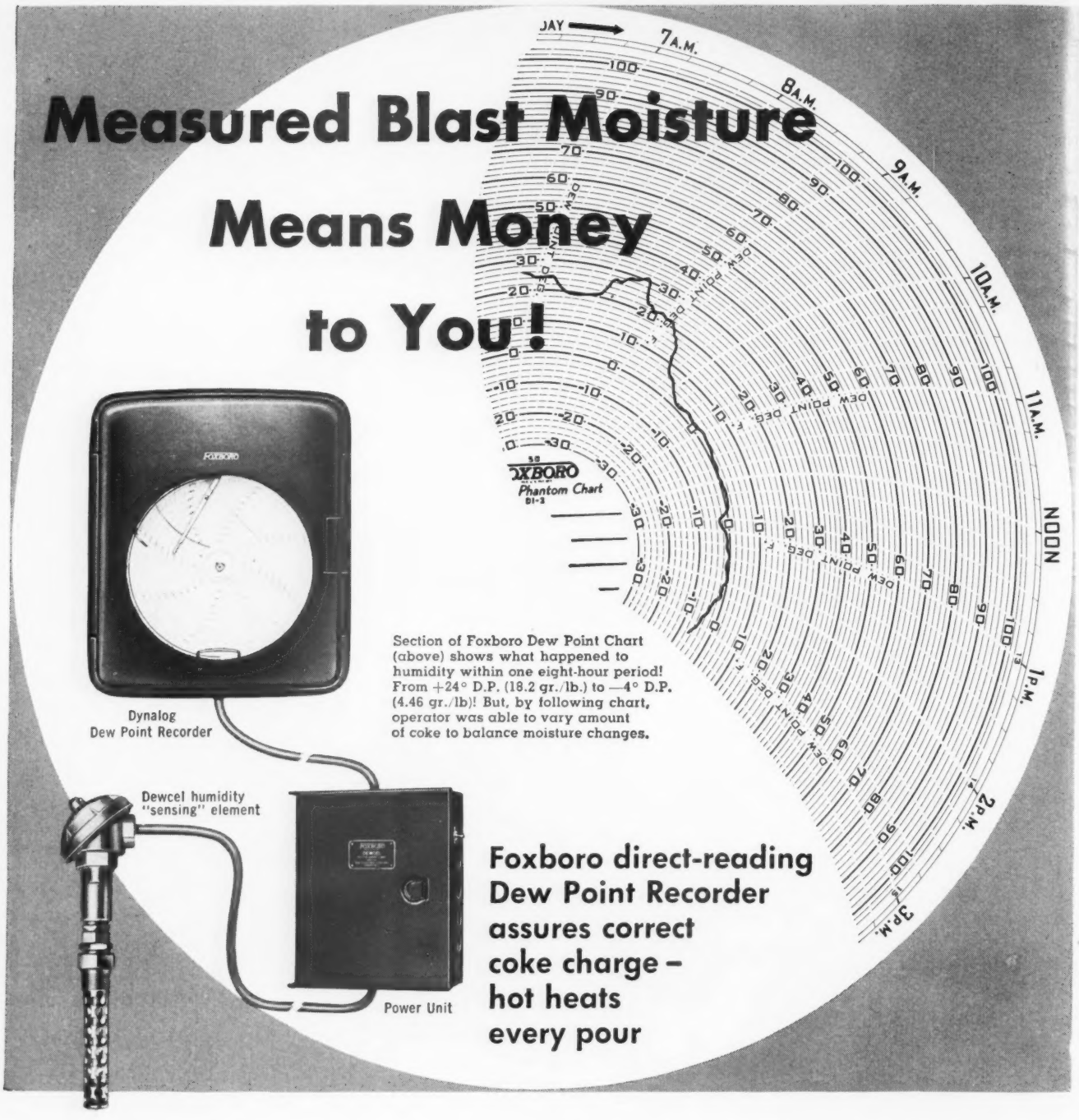
Write today for free literature and prices.
All orders given prompt attention.

THE FREMONT FLASK COMPANY • FREMONT, OHIO

LIGHTER, STURDIER MAGNESIUM FLASKS • CAST IRON AND ALUMINUM JACKETS

Measured Blast Moisture Means Money to You!



Section of Foxboro Dew Point Chart (above) shows what happened to humidity within one eight-hour period! From +24° D.P. (18.2 gr./lb.) to —4° D.P. (4.46 gr./lb)! But, by following chart, operator was able to vary amount of coke to balance moisture changes.

Foxboro direct-reading Dew Point Recorder assures correct coke charge – hot heats every pour

You can accurately compensate for the widest **variations** in blast moisture . . . pour consistently **hot** heats every day using the Foxboro Dew Point Recorder. Its *continuous* chart record of atmospheric moisture provides a foolproof basis for modifying the coke charge . . . eliminates coke waste and costly "cold metal" pours.

And you don't have to "baby" *this* Recorder. Accuracy is unaffected by ambient temperature changes. No critical adjustments . . . practically no maintenance! Step up efficiency *and* economy in *your* cupola operation. Write, or ask your nearby Foxboro Field Engineer for Data Sheet 330-1 on recording, and control, of blast moisture.

THE FOXBORO COMPANY, 323 NEPONSET AVENUE, FOXBORO, MASS., U. S. A.

FOXBORO REG. U. S. PAT. OFF. **DEW POINT RECORDERS**

FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND

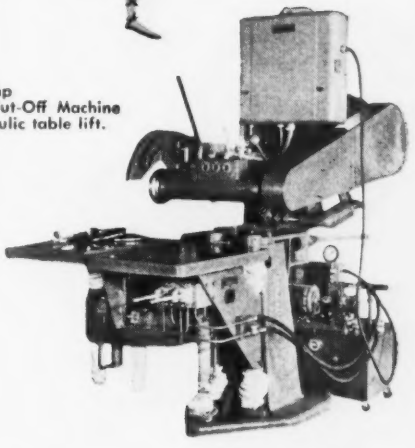
NEW MUSCLES

for TABOR-BRASIVE CUT-OFFS

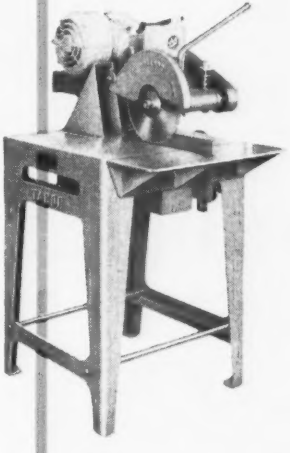
Recent improvements in Tabor-Brasive Cut-Off Machines offer increased advantages in foundry operations.

A new hydraulic table lift reduces operator fatigue and speeds cutting time with the redesigned 15 hp Tabor Machine. The redesigned 5 hp machine gives a full range of cutting service with increased table room.

Tabor-Brasive Cut-Off Machines do so many things so well that many foundries use them exclusively. They are used for dry or wet cutting, right angle or bevel. They will cut practically any metal, including tough materials like nodular iron and titanium. Units range from 5 hp to 20 hp. Write for Tabor literature or ask to see the Tabor man — the technical man.



Redesigned 15 hp Tabor-Brasive Cut-Off Machine with new hydraulic table lift.



Redesigned 5 hp Tabor-Brasive Cut-Off Machine with extra table room.

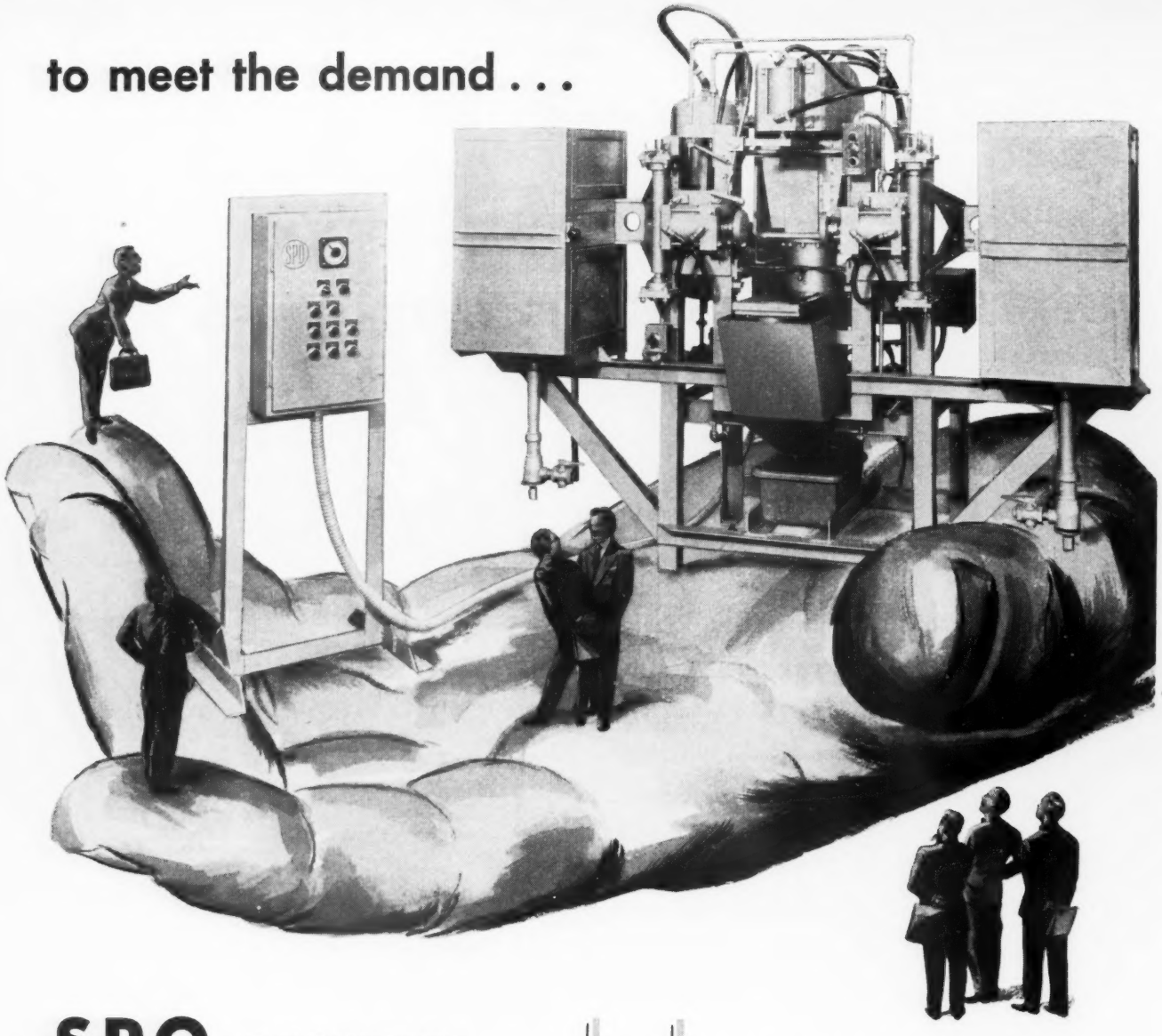
THE TABOR MANUFACTURING CO.
Division of Turbo Machine Company
Lansdale, Pa.

TABOR

THE TABOR MAN **TM**

TM IS A TECHNICAL MAN

to meet the demand . . .



SPO PRESENTS THE MODEL 20 holo-core MACHINE

These intricate precision cores were produced with SPO Holo-Core machines.

Immediate acceptance . . . and sales . . . of SPO's first hollow core machine, the Model 10, showed the need for a similar unit of larger capacity. And this is it . . . *the new Model 20.*

Featuring the same basic simplicity, economy and speed of operation, Model 20 will handle core boxes up to 20 x 16 x 10 inches in size. It produces ready-to-use uniform standard cores in a 45-second cycle. Both semi-automatic and manually operated models are available.

SPO Holo-Core machines are the answer to core production and quality control problems. Hollow cores permit faster, easier shake-out . . . eliminate venting problems . . . assure closer tolerances and more uniform castings.

Write for Bulletin SC-100 for details and prices.

SPO INCORPORATED

6449 GRAND DIVISION AVENUE
CLEVELAND 25, OHIO

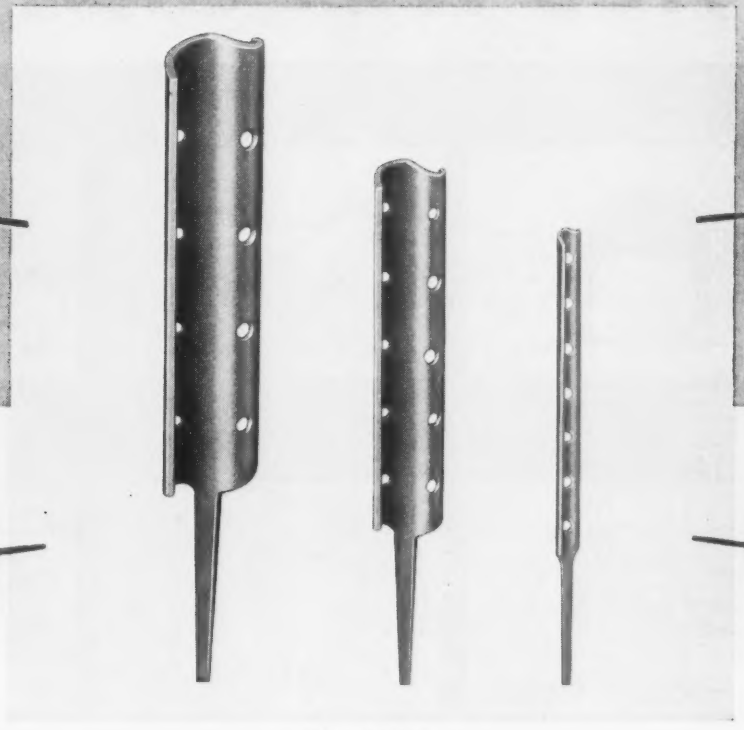
6655-81

Now fine FANNER FAN-S-CHILLS

for general chilling applications—light or heavy sections

LIGHT WEIGHT

LESS MASS



GREATER CHILLING SURFACE AREA

GREATER FUSION

Patent Pending

WITH THE EXCLUSIVE DESIGN

THAT PROVIDES FAR GREATER CHILLING *plus* EXTRA SAVINGS IN COST

Here is a fine FANNER Chill that is winning the praise of users everywhere throughout the industry. The Fan-S-Chill is another result of the continuous research and development that have produced so many other fine FANNER Chills.

The Fan-S-Chill, through its curved "S" design offers 75% more chilling surface with less weight since there is no solid mass. Moreover because of its curved "S" design and holes which permit more thorough flow of metal it fuses and locks into the cast metal solidly and completely. Since it is light in weight it offers savings in cost, shipping and handling. Made of formed steel, it is ideal for general chilling purposes, especially in steel.

You will be interested in the many cost saving features of the fine FANNER FAN-S-CHILL, so write today for samples and prices.

SPECIFICATIONS

WIDTH — ⅜" — ¾" — 1¼"

LENGTH — ½" to 4"

Made in heavy, medium and light gauges

Copper, aluminum or tin coated

Lighter or heavier FAN-S-CHILLS in special sizes can be made on request

Qualified and specialized engineers in Fanner's Technical Service Division are available for consultation, without obligation, on problems of producing more intricate castings; developing increased strength, closer tolerances, and better quality; reducing machining and improving finish — both in ferrous and non-ferrous castings. Take advantage of the research and development work that Fanner has invested in this field to improve your profit picture! Simply direct your request to the address shown below.

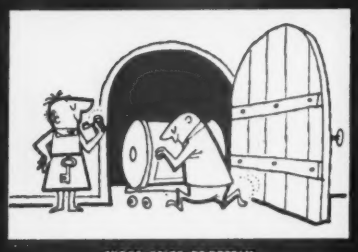
THE FANNER MANUFACTURING CO.

Designers and Manufacturers of Fine Fanner Chaplets and Chills

BROOKSIDE PARK CLEVELAND 9, OHIO

MORE CARRY IN YOUR

Free Wall Chart gives

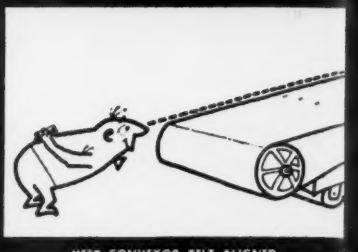


STORE BELTS PROPERLY

Heat, light and air promote oxidation of rubber, so belts should not be stored near steam pipes, radiators, hot air registers, etc. Ideal place is in a cool dark cellar, free from moisture, heat and frost.

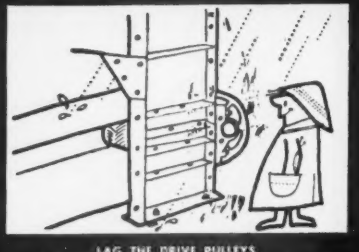
KEEP TONNAGE RECORDS

Carefully kept tonnage records on each belt plus the repair costs on each belt will indicate when repair costs have become excessive. When this point is reached, it is cheaper to put in a new belt.



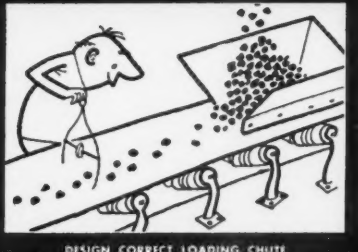
KEEP CONVEYOR BELT ALIGNED

Incorrect alignment caused by lopsided load, misalignment of conveyor idlers, faulty splice and insufficient belt contact can result in edge wear, snagging, spillage and uneven tension. For difficult problems try return and troughing trainers.



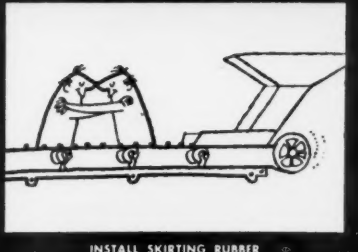
LAG THE DRIVE PULLEYS

Top quality grooved lagging prevents belt slippage caused by wet or frosty conditions and prevents pulley wear. Bolted-on lagging eliminates need for carrying spare lagged pulleys and for time-consuming, expensive relavering.



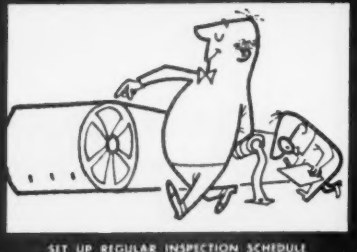
DESIGN CORRECT LOADING CHUTE

Correct chute should place the material in the center of receiving belt in the direction of belt travel, at the belt speed and with no impact. Poor chute design results in damage to belt cover and carcass.



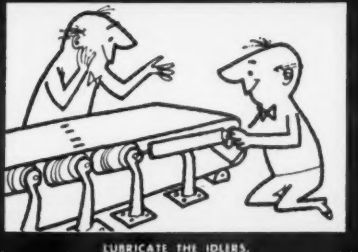
INSTALL SKIRTING RUBBER

This serves two purposes — prevents spillage at the loading point and properly shapes the load on the belt. Skirting should be all-rubber, not old conveyor belt. Allow for clearance as skirting should not come in contact with belt.



SET UP REGULAR INSPECTION SCHEDULE

Daily and weekly inspections will often reveal belt damage or excessive belt wear. Repairs or corrective measures can be immediately applied to prevent the damage from becoming more serious.



LUBRICATE THE IDLERS, BUT DON'T OVERDO IT

Except in extremely dusty or wet conditions, idlers should be greased only once every six months — otherwise, you may break grease seal and grease will rot the bottom cover of your belt.

INSPECT METAL FASTENERS FREQUENTLY

Keep fasteners tight. Replace worn or broken parts. If belt is broken at the fastener joint, cut back and re-fasten. Properly maintained fasteners will minimize splice failures, down-time and possible damage to the belt itself.

INDUSTRIAL DIVISIONS
PRODUCTS

CONVEYOR BELTING • CONVEYOR MACHINERY
INDUSTRIAL HOSE • VIBRATING CONVEYORS
VIBRATING SCREENS • DESIGN, MANUFACTURE,
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COMPLETE BULK MATERIALS HANDLING SYSTEMS
"GLIDE RIDE" THE NEW MOVING SIDEWALK

This wall chart, 23" x 33" in two colors, has many valuable tips that will enable you to increase the life of your conveyor belting. To obtain a copy, contact

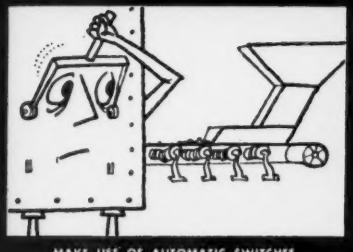
HEWITT

INCORPORATED • EXECUTIVE

CONVEYOR BELTING

the answers

USE IMPACT IDLERS AT LOADING POINTS
Some of the shock of impact at such points is absorbed by these idlers, resulting in less strain both on the carcass and covers of the belt.



MAKE USE OF AUTOMATIC SWITCHES
These switches will shut down the belting in case it breaks, in case of excess slipping on the drive pulley, or if the feeders or chutes choke up.

REPAIR IMMEDIATELY CONVEYOR BELT DAMAGE
Unattended damage to the belt permits dirt and moisture to attack the fabric. Also, if the use of a damaged belt is continued, the impact and the sliding passage of injured areas over idlers and pulleys will enlarge the damage. The damaged spot should be cut out soon as noticed, and new rubber vulcanized into the hole.

Which is the best belt for you?

For Mining *(Metallic and Nonmetallic)*

Maltese Cross for especially severe service. Ajax for general heavy duty service, and Conservo for general light duty service. Exceptionally severe for special conditions may require use of specially designed Hewitt-Robins belts such as Shock Pad, CR-50 and CR-70, Raynile and Super-Raynile, Ajax Underground and Monarch Neoprene fire-resistant belting.

For Metal Processing

Maltese Cross for exceptionally severe service. Ajax for general heavy duty service, and Monarch Neoprene for oily service. Maltese Cross Fiberglas Hot Material, Maltese Cross Fabric type Hot Material and Hewitt Hot Service are especially designed for hot material handling.

For Public Utilities

Monarch Neoprene for oily service, Maltese Cross Hot Material and Hewitt Hot Service for hot material handling. Maltese Cross for especially severe service and Ajax for general heavy duty service.

For Food Processing

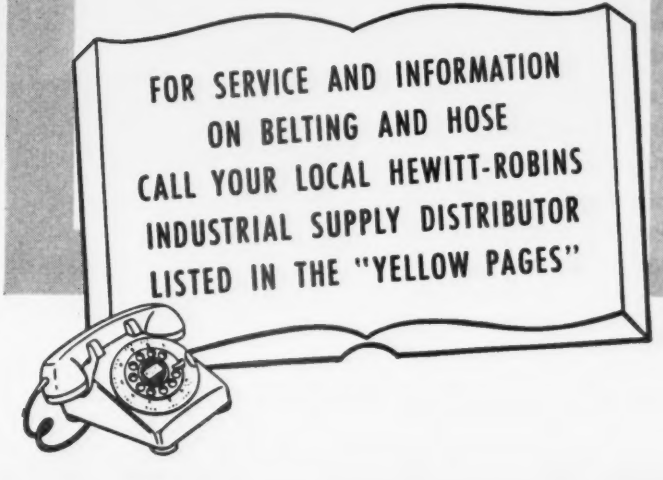
Canners and Packers and Hewlite for food handling, Monarch Neoprene for oily service, Ajax Rufftop, Conservo Rufftop and Conservo Transport for package handling. Monarch, Ajax and Conservo for grain and feed handling.

For Materials Handling

Conservo for portable conveyors. Ajax Rufftop, Conservo Rufftop, Conservo Transport and Hewlite for package conveyors.

For Chemical Processing *(Including Pulp and Paper)*

Maltese Cross for exceptionally severe service, Ajax for general heavy duty service, and Conservo for general light duty. Maltese Cross Fiberglas Hot Material, Maltese Cross fabric type Hot Material and Hewitt Hot Service are especially designed for hot material handling.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your local HR Industrial Supply Distributor or write to our executive offices in Stamford, Connecticut.

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OFFICES: STAMFORD, CONN.

YOU'LL DO A BETTER JOB

with **H. V. ADAMS DESIGNED**

HIGH EFFICIENCY FOUNDRY TOOLS

"UNIVERSAL FREE WHEELING"

FOUNDRY SAND RIDDLE

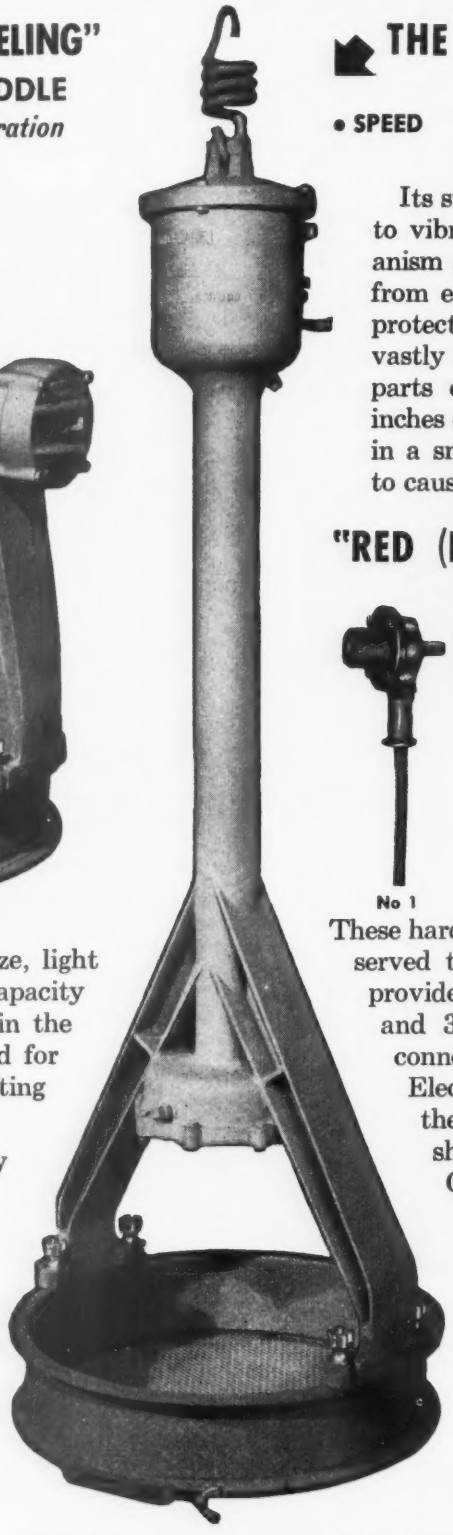
with the Double Eight Vibration

Because of its convenient size, light weight and good riddling capacity it long has been a favorite in the foundry. It also can be used for mixing core sand or for sifting sand directly into molds.

The mechanism is entirely enclosed protecting it from harmful dust and grit.

The main frame is cast in very strong tough aluminum.

It uses quick change ferruled sieves with 20 in. diameter sifting area. There are no loose wires to harm hands.



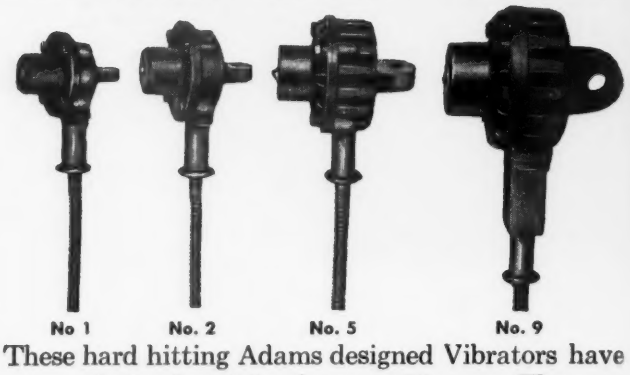
THE "ROTOPLANE" SPEED SIFTER

WILL GIVE YOU

- **SPEED**
- **ECONOMY**
- **SAFETY**
- **LONGER LIFE**
- **GREATER SIFTING CAPACITY**

Its sturdy one-piece frame and long shaft add to vibration effectiveness. The sealed-in mechanism assures protection of motor and bearings from exposure to dust and grit. This sealed in protection and "Rotoplane's" free-rotary action vastly increase bearing life. No exposed moving parts endanger the operator. Sieves have 20 inches diameter clear sifting area—are mounted in a smooth steel ferrule with no jagged edges to cause dangerous cuts and scratches.

"RED (Devil) ELECTRIC" VIBRATORS



No 1 No. 2 No. 5 No. 9

These hard hitting Adams designed Vibrators have served the foundries for over 30 years. They are provided with a 6 foot 3 wire authorized cable and 3 wire grounded connector which, when connected with our 3 wire grounded Red Electric Knee Switch, automatically grounds the vibrator protecting the worker from shock. The vibrators have passed the U. S. Government code inspection.

Other Foundry Products:

- **No. 11 NOISELESS TYPE VIBRATOR**
- **A-20 ELECTRIC VIBRATOR**
- **RED ELECTRIC KNEE SWITCHES**
- **"ROTO" ADJUSTABLE BIN VIBRATOR**
- **2 MIN. UNIVERSAL FINENESS TEST SIFTER.**
- **UNIVERSAL TRIPOD CARRIER**

ORDER ALL SIFTERS AND VIBRATORS WITH GROUND WIRE!!

FOUNDRY SUPPLIES MANUFACTURING CO., NOT INC.

2221 Orchard Street - Chicago 14, Illinois

Established 1918 **Cable Address: "Rotoplane Chicago"** **H. V. ADAMS, Mgr.**

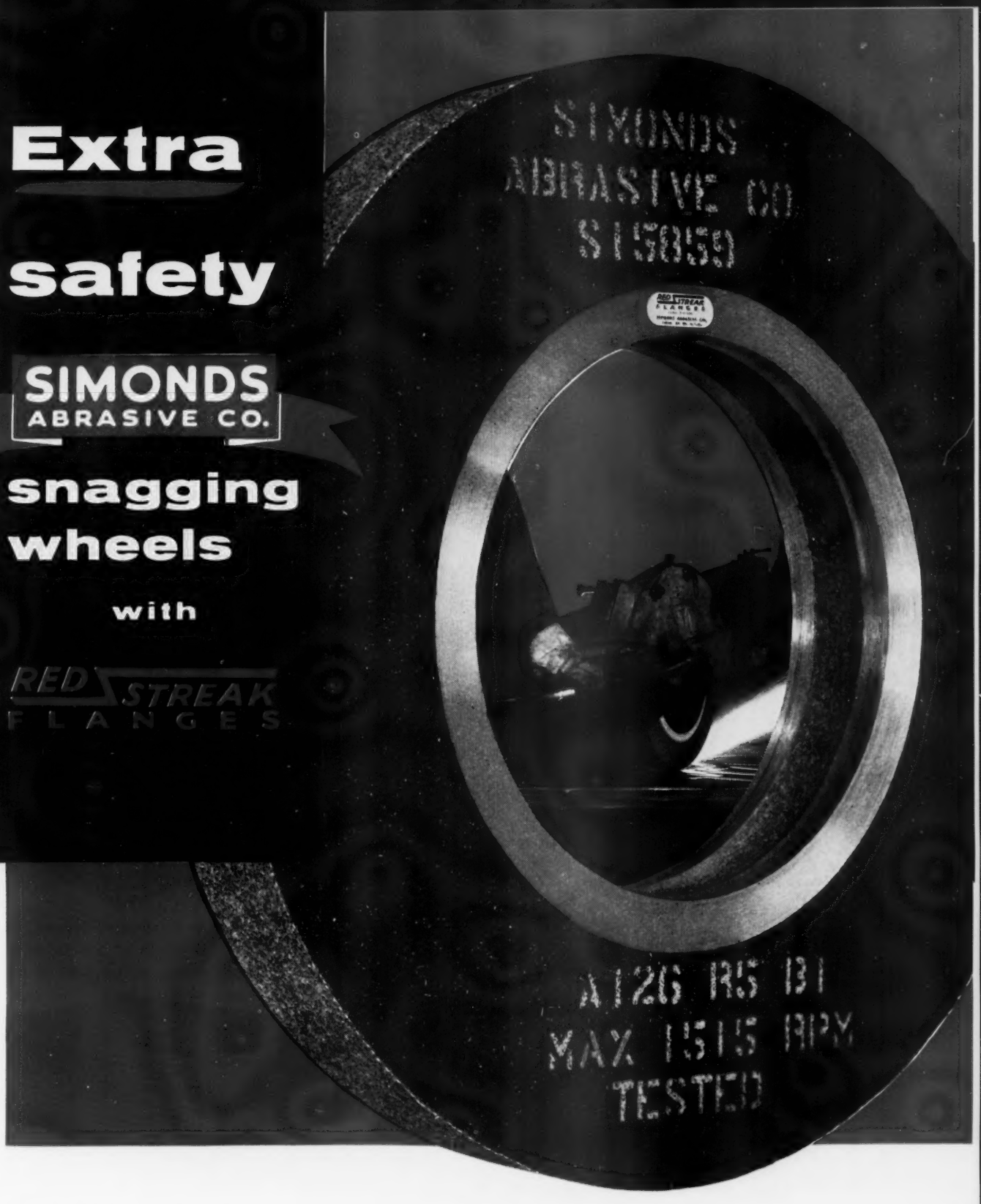
Extra safety

SIMONDS ABRASIVE CO.

snagging wheels

with

RED STREAK FLANGES



Strong, high-speed resinoid bonded wheels with built in circular steel flanges. Exceptional for fast stock removal, long wheel life and extra protection against radial cracking. Easy to mount. Accurate balance, true running for superior grinding action. In 6″, 10″ and 12″ hole sizes. Send for bulletin ESA—62.

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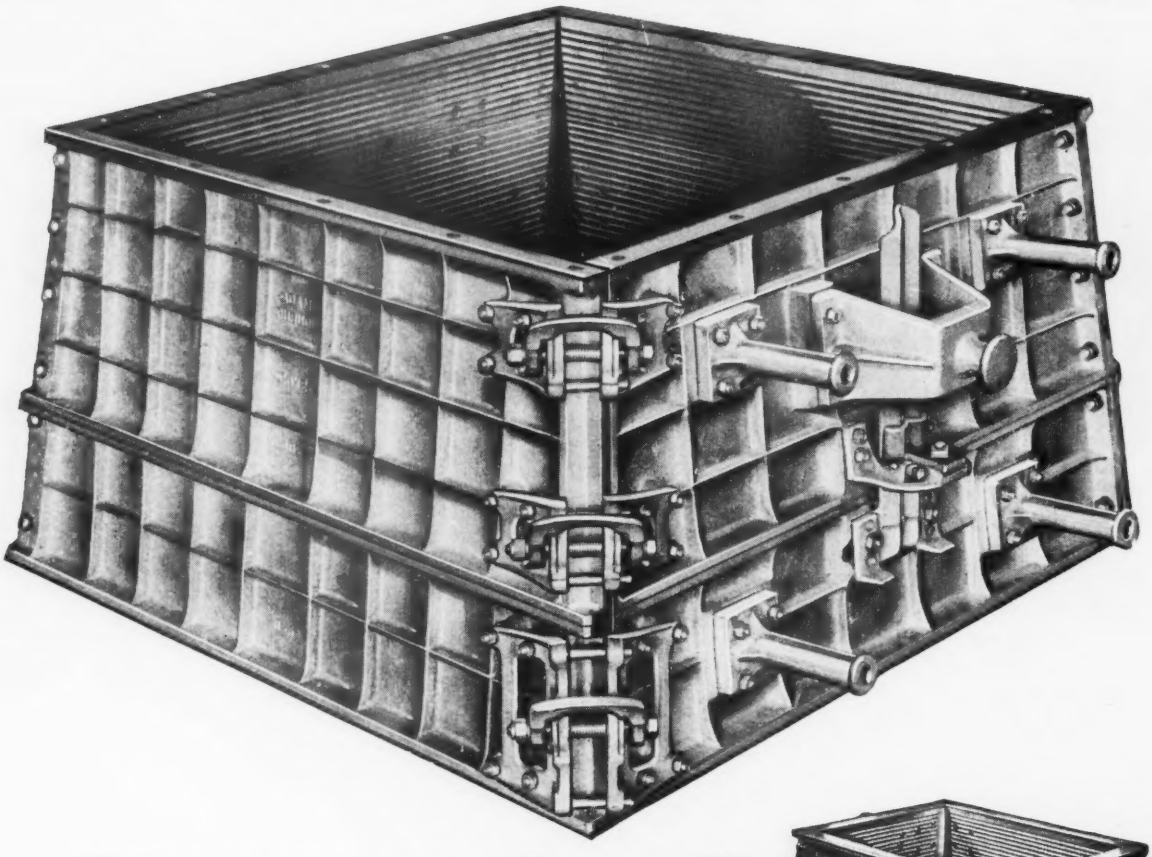
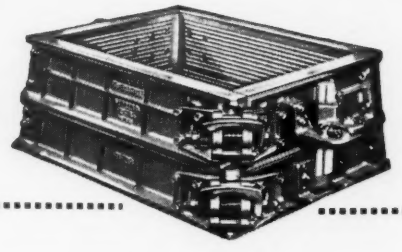
Adams Aluminum Easy Off Flasks



Large or Small



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Assures you another winning combination from the most complete line of quality flask equipment.

Write us today for further information. Let Adams help you analyze your flask equipment problems.

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ESTABLISHED 1883

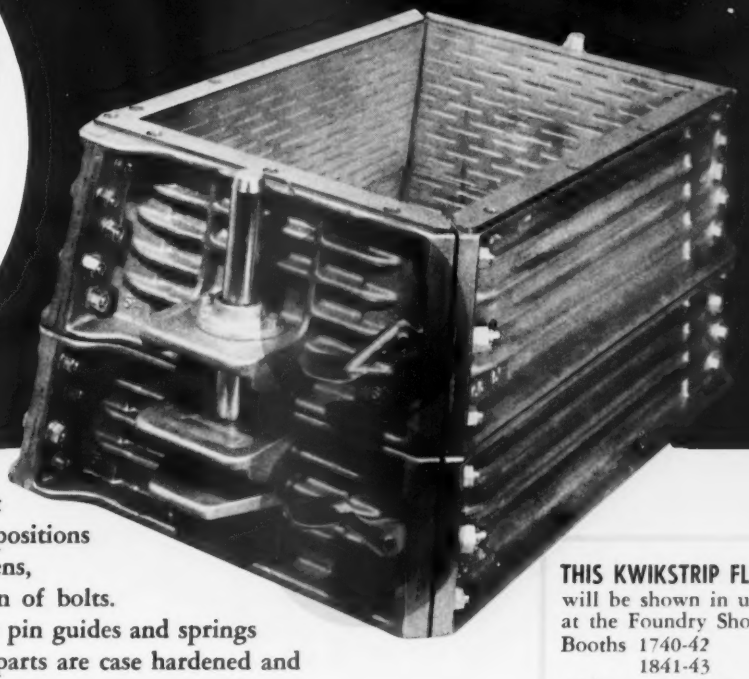
MOLDING MACHINES and FLASK EQUIPMENT

700 FOSTER STREET, DUBUQUE, IOWA, U.S.A.

For more information, use Reader Service Card, page 201

for MORE and BETTER MOLDS...

you can't beat the MONARCH KWIK-STRIP MECHANICAL CORNER FLASK



Locking handle bolts work directly in a straight line. Handles can be placed in any one of four positions (up and down position shown above). Flask opens, closes and locks with positive straight line action of bolts. Binding on working corner is eliminated. Corner pin guides and springs are completely sealed against sand. All working parts are case hardened and cadmium plated. Draw pins are hard chrome plated, centerless ground and polished for true diameter. Forged and plated guide bushings. Cold Rolled wear strips are standard on top of cope and bottom of drag. Wear strips on parting flanges optional. Sides are flat so flask can be set on edge without danger of tipping.

THIS KWIKSTRIP FLASK will be shown in use at the Foundry Show
Booths 1740-42
1841-43
Aisles 1700-1800

CONSTRUCTION: Precision built from cast aluminum or magnesium. Made with the most modern jigs and fixtures and machine tools to insure accuracy.

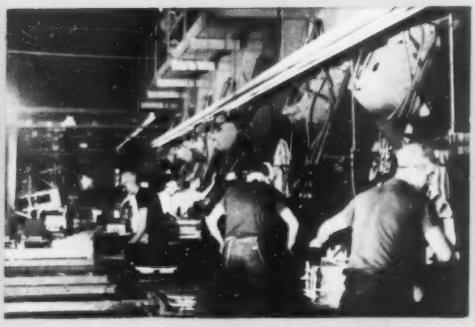
AVAILABLE SIZES: 12″ width x 4″ depth to 30″ width x 7″ depth; 12″ long x 4″ depth to 30″ long x 7″ depth, in increments of one inch. Upsets available in 1″ x 2″ depths 4° and 5° tapers available.

Cast aluminum or iron jackets available to fit all flask sizes listed above.

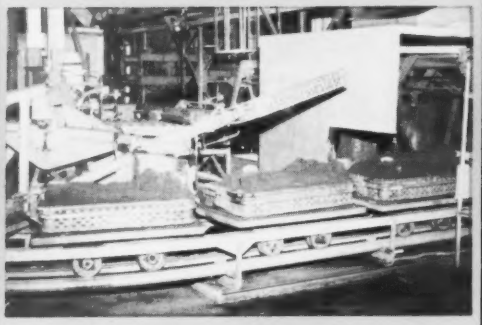
"Another Foundry product by"... **NEWAYGO** engineering company newaygo, michigan

FROM INDIVIDUAL UNITS TO COMPLETE SYSTEMS

our job is serving your sand handling needs better



COMPLETE SANDHANDLING SYSTEMS

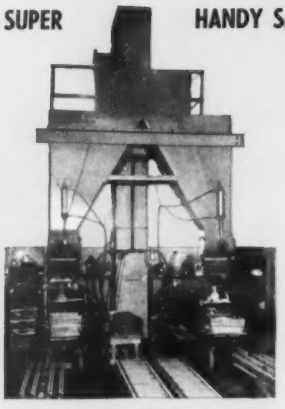


CAR CONVEYORS

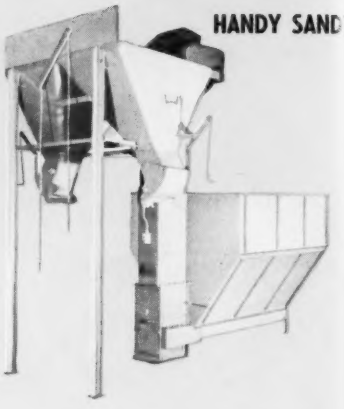
PALLET TYPE CONVEYORS

REDDY SANDY

SUPER HANDY SANDY



HANDY SANDY



"Foundry Business is BIG Business"

NEWAYGO engineering company

NEWAYGO, MICHIGAN

. . . and profitable too, with **NEWAY® MOLD HANDLING, SAND HANDLING AND CONDITIONING EQUIPMENT**

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RUSSO FOUNDRY EQUIPMENT CO. 3882 Fairway Avenue Oakland 5, California Phone: Lockhaven 8-1303	Arizona, California, Idaho, Montana, Nevada, Oregon, Utah, Washington Canada—British Columbia, Alberta, Saskatchewan
MR. LEO J. GARDNER 19421 Story Road Cleveland 16, Ohio Telephone: Edison 1-1277	Ohio (all but N.W. corner) Western Pennsylvania West Virginia Covington, Kentucky
MR. A. N. VOLK 4352 North Keeler Avenue Chicago 41, Illinois Telephone: Avenue 3-0855	Illinois (northern half) Iowa, Minnesota Wisconsin
MR. O. H. KASTENS Newaygo Engineering Co. Newaygo, Michigan Telephone: 3821	Indiana (northeastern) Michigan (southern half) Ohio (northwestern corner)
MR. G. E. MARCKRES 426 West Wabash Street Bluffton, Indiana Telephone: 1612-W	Indiana (all but northeastern section)
MR. R. W. FERGUSON Newaygo Engineering Co. Newaygo, Michigan Telephone: 3821	Michigan (northern half) Michigan (Upper Peninsula)
NEWMAN FOUNDRY SUPPLY CO. 665 Pine Avenue, P. O. Box 160 St. Lambert, Montreal 23, Quebec, Canada Telephone: Orchard 1-1926	Canada—Prov. of Ontario and Quebec, east of Kingston; New Brunswick, Nova Scotia and Prince Edward Island
WARK FDRY. EQUIP. CO. P. O. Box 2308, Hiler Br. Kenmore, New York Telephone: Riverside 4469	New York State (except Metropolitan New York) Pennsylvania (northwest)
DON BARNES FDRY. SUPPLIES & EQUIP. 605 James Street North Hamilton, Ontario, Canada Telephone: Jackson 7-7436	Canada—Prov. of Manitoba and Ontario east to Kingston
MR. C. H. PALMER, Jr. 32 Tamarack Lane Levittown, Pennsylvania Telephone: Windsor 5-1508	Metropolitan New York New Jersey Delaware Maryland, Washington, D.C. Pennsylvania (central) Virginia, North Carolina, South Carolina
MR. L. C. (Carl) BEERS 19021 Hillcrest Blvd. Birmingham, Michigan Telephone: Midwest 4-7798	Special representative in the Detroit Area
MR. R. J. BRANDT N. E.—Brandt Co. Cocheco Avenue Branford, Connecticut Telephone: Hubbard 8-2143	Connecticut, Vermont Maine, Massachusetts New Hampshire Rhode Island

news FROM LIQUID CARBONIC

1. MIX SAND AND BINDER

Inexpensive liquid binder is mixed with any clay-free core sand in conventional mulling machine.

2. PACK CORE BOX IN USUAL WAY

Sand should be cold. CO_2 hardening is adaptable to all types of core making machines.

3. APPLY CO_2 GAS

Several methods are satisfactory. A 15-to-20-second application of CO_2 cures core completely.

4. CORE IS READY FOR USE

Cores may be used immediately without stockpiling.

from **PACKED CORE BOX**

to **CURED CORE**

in 20 seconds flat!

CO_2 curing is the answer! Cores are cured by instantaneous chemical reaction. CO_2 gas reacting on a special sand binder completely eliminates time-consuming baking. You get sound, hard, perfectly formed cores and molds — *of any shape or size* — with almost unbelievable speed. Another important advantage —CO_2 cured cores are hardened right in the box—thus giving more accurate dimensions.

CO_2 core curing is as foolproof as it is fast. The photos show the four simple steps to faster, perfectly cured cores and molds. Want the *complete* story? Just mail the coupon below.

FREE BULLETIN *gives the complete story on CO_2 core hardening process. Mail the coupon for your copy.*

THE LIQUID CARBONIC CORPORATION
3150 South Kedzie Avenue • Chicago 23, Illinois

Please send me your Bulletin No. 5644 on CO_2 Core and Mold Curing.

Name_____

Title_____

Company_____

Address_____

City _____ Zone____ State_____

QUICK CHANGE WITH UNIVERSAL STANDARD PRESS-FIT FLASK PINS AND BUSHINGS

To compensate for wear in the ear holes of cope and drag, standard size Universal Press-Fit Flask Pins and Bushings are available with three different outside diameters, the second slightly larger than the original size and the third slightly larger than the second. Thus, as the ear holes increase in size—and replacement of the original pins and bushings becomes necessary—pins and bushings with a larger outside diameter are available to provide a good, tight fit in the larger ear holes without welding or other expensive, time-consuming operations. Just drive out the old, press in the new . . . truly "quick change"!

Universal Flask Pins and Bushings of all types are available in a complete range of sizes as regular stock items. Plain, taper, threaded or hexagonal series. For complete information, write to Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.; or the home office.

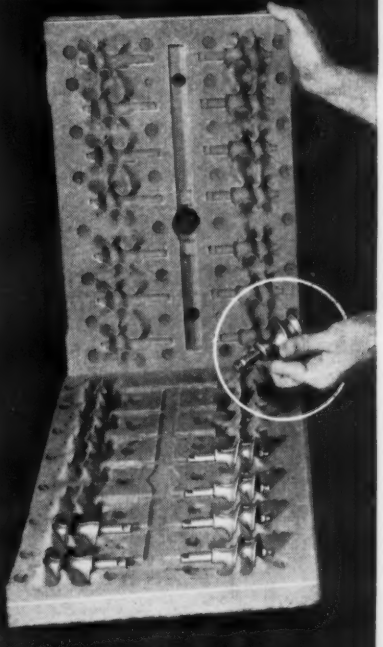
186

UNIVERSAL ENGINEERING COMPANY FRANKENMUTH 4, MICHIGAN

FOR FASTER CURES...SMOOTHER SURFACES...BETTER CASTINGS

CATALIN SHELL MOLDING RESIN 9616

View of automatic shell mold machine, indicating shell ejection operation, shown to left... And a typical shell mold specimen, shown below... were photographed at the foundry of C. A. Goldsmith Company, Newark, N. J.



Higher production rates, new advanced techniques and automatic equipment, smoother and more accurate castings are the direct industrial contribution of the shell molding process . . . yet without fast-setting phenolic resins to bond the sand, the entire process could never have been possible! Since first introduced, too, shell molding resin formulations have also undergone self-transition periods of change and betterment.

Today Catalin Resin 9616, a two-stage, powdered phenol-formaldehyde resin, emerges as the very latest and best type of formulation.

This economical resin produces high-speed curing rates with the minimum of resin content. Savings are achieved in time, sand, work space, handling and metal. Castings are more accurate and smoother — require considerably less finishing.

In addition to Shell Molding Resin 9616, Catalin produces a wide range of core binding liquid resins and powders for the production of ferrous and non-ferrous metal castings.

Catalin representatives, familiar with the requirements of the foundry industry, are available for consultation. Samples on request! Write . . .

CATALIN CORPORATION OF AMERICA
ONE PARK AVENUE, NEW YORK 16, N. Y.

Catalin

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GREENSBORO, N.C., 630 Southeastern Bldg.

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AIR COMPRESSORS
AIR HOISTS
AIR CYLINDERS

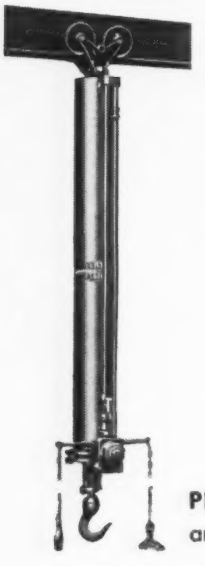
A plentiful supply

of air to speed production throughout your plant is assured with powerful, precision-built *Curtis* Air Compressors.

- **air-cooled, two stage—¼ to 20 H.P. inclusive**
- **water-cooled, single stage—20 to 50 H.P. inclusive**
- **Timken tapered main bearings permit easy external adjustment**
- **long-life pressure-lubricated connecting rod and piston pin bearings**

Tank-mounted compressors in sizes from ¼ through 15 H.P. inclusive (1 to 78 cu. ft.)—also available in base-mounted type.

Simple and base-mounted compressors from ¼ through 50 H.P. inclusive (1 to 300 cu. ft.).

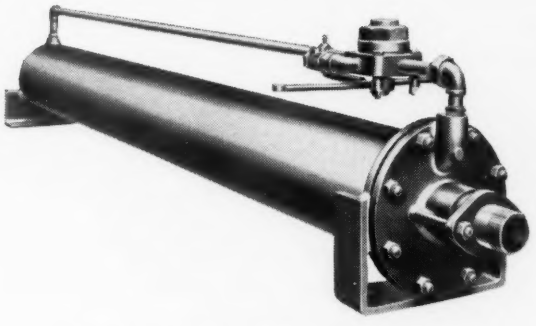


LIFT, LOWER, PUSH or PULL

easily, economically and safely with *Curtis* Air Hoists and Cylinders . . . capacities up to 10 tons.

- **lower initial cost**
- **lower maintenance costs**
- **smooth operation and precision control**
- **self-closing, rotary disc self-grinding valves**

PENDANT AIR HOISTS . . . ideal for any lifting or lowering operation.



BRACKETED AIR CYLINDERS . . . can be mounted horizontally or vertically for lifting, lowering, pushing or pulling.

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FOUNDRY RESEARCH

includes Lectromelt* Furnaces when building for the future

RECOGNIZING the importance of the electric arc furnace to the modern iron and steel foundry, research laboratories now include them for help in developing methods and solving metal problems. The two Lectromelt Furnaces shown above are in such a foundry—small enough to expedite experiments, big enough to simulate production runs.

Lectromelt Furnaces give the exact control of heat and analyses needed to make today's engineered castings. With metallurgical research finding more and more uses for special alloy castings, specifications are tougher, yet a good foundry with a Lectromelt Furnace can meet these rigid requirements.

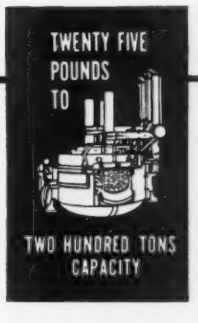
Our engineers will answer your questions covering all sizes of furnaces. Catalog No. 9-A describes them. For a copy, write Pittsburgh Lectromelt Furnace Corporation, 314 32nd Street, Pittsburgh 30, Pennsylvania.

Manufactured in . . . GERMANY: Friedrich Kocks GMBH, Dusseldorf . . . ENGLAND: Birlec, Ltd., Birmingham . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa . . . JAPAN: Daido Steel Co., Ltd., Nagoya

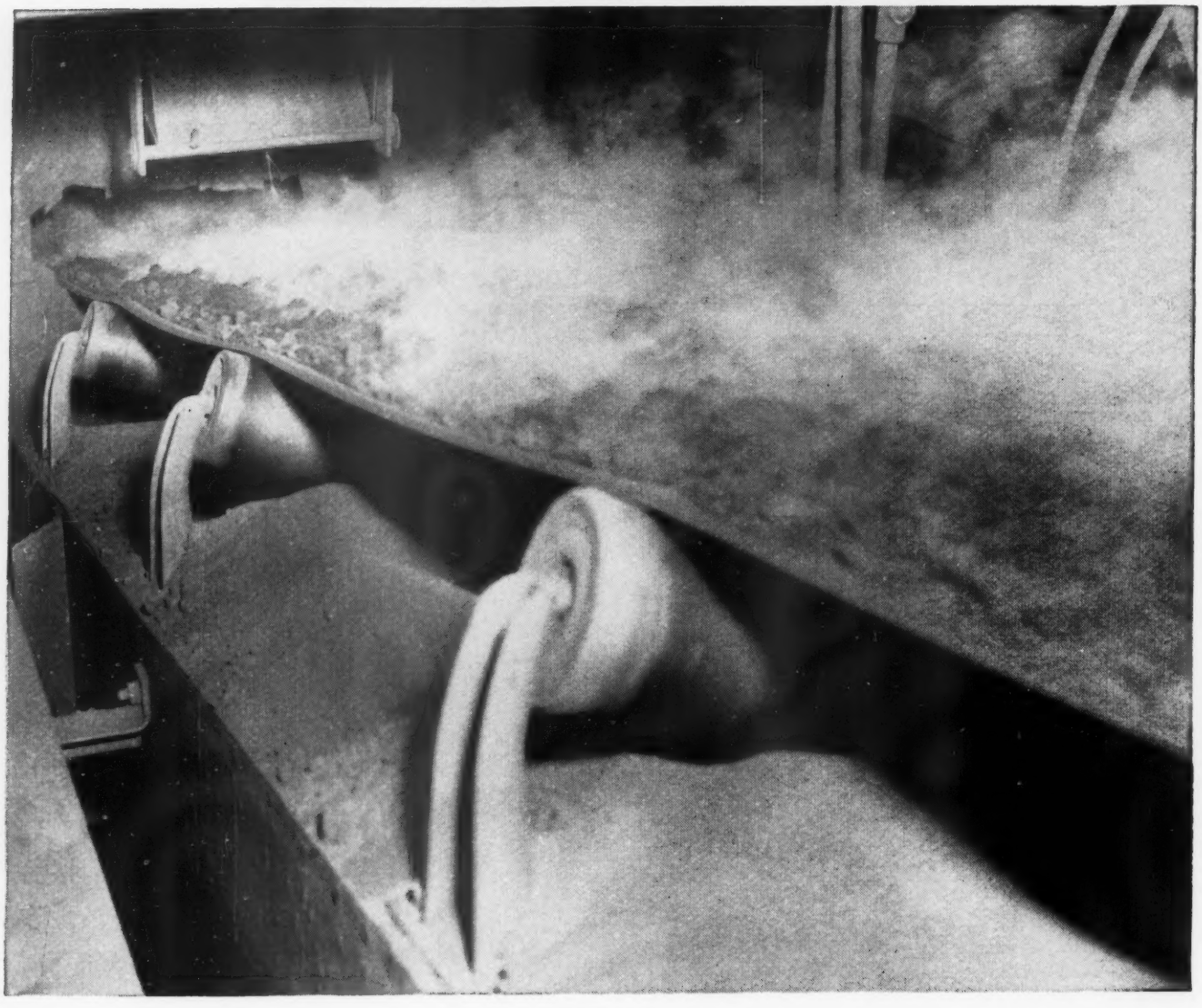
*REG. T. M. U. S. PAT. OFF.

MOORE RAPID

WHEN YOU MELT... *Lectromelt*



RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Too hot to handle but it travels on rubber

A typical example of B. F. Goodrich improvement in rubber

THAT moving rubber platform is carrying sizzling hot chunks of iron and sand in a foundry. The heat had been ruining belts in a few months.

Then the company heard that B. F. Goodrich had developed a special heat-resisting rubber that can stand hot materials that would char or burn ordinary rubber. They built this rubber into a belt. Then, for good measure, added a layer of nylon cords near the surface to help prevent damaging cracks in the cover.

This improved B. F. Goodrich belt is what you see in the picture. It has already outlasted any other belt ever used here and looks good for double the life.

Product improvement is *always* going on at B. F. Goodrich. Some improvements are big, spectacular; some are little; many are too technical to explain easily, but all save you money. Every product gets its share—conveyor belts, V belts, every kind of hose, hundreds of others. None is ever regarded as "finished" or standardized.

How this cuts your costs: Biggest cost savings come almost always from top performance rather than lowest prices. If you use rubber products, remember B. F. Goodrich is one company that will *never* lower its quality standards. This means you can be sure of top performance and real money savings. If you want this extra value, these lower costs year after year, always call your B. F. Goodrich distributor. Find out about the latest improvements or try out the latest and best types of any rubber products you buy. *The B. F. Goodrich Company, Dept. M-574, Akron 18, Ohio.*

B.F.Goodrich
INDUSTRIAL PRODUCTS DIVISION

For Every
JOBBING FOUNDRY
Requirement . . .

NEVILLE PIG IRON

AMERICA'S jobbing foundries are vital to the nation's industrial strength, for they provide an almost endless variety of gray iron castings for virtually every industry in the country.

This message is addressed to *you* as a jobbing foundry operator. Whether you are producing small or large castings . . . a special analysis or a standard gray iron, we believe that we can help you.

More and more jobbing foundries depend on Neville Pig Iron because we not only produce but *stock* a wide variety of analyses. We can meet virtually any foundry pig iron requirement you may have . . . and *promptly.*

Why not let Neville *quality* and *ready availability* work on *your* side? We'll be glad to discuss your specific problems and requirements. Technical assistance is available without obligation.

WSW 5992

Neville Pig Iron and Neville Coke for the Foundry Trade

COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

here's why

MORE FOUNDRYMEN PREFER

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"Purite gives 100% fluxing action in the cupola—100% desulphurizing action in the ladle."

"Purite comes in uniform 2-lb. pigs—no weighing or measuring required."

"Purite permits the use of higher-sulphur raw materials."

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"Purite is time-tested and proved for rapid and unsurpassed desulphurizing uniformity."

"Purite is 100% pure fused soda ash—you do not pay for inert materials."

"Purite produces higher percentages of finished castings—fewer rejects per ton of metal poured."

"Purite does not crumble—is easy to handle—no waste, no dust."

"Purite, the scientific flux for better melting and cleaner iron, is sold by leading foundry supply houses in the United States and Canada."

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INDUSTRIAL CHEMICALS DIVISION · BALTIMORE 3, MD.

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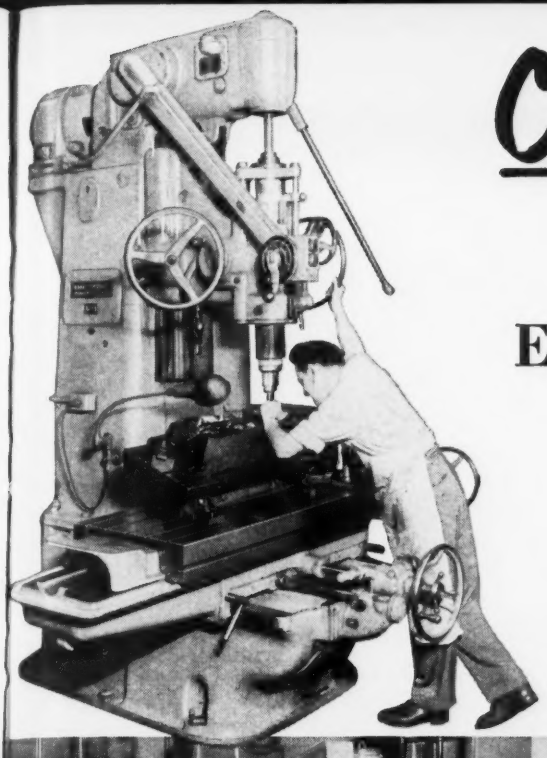
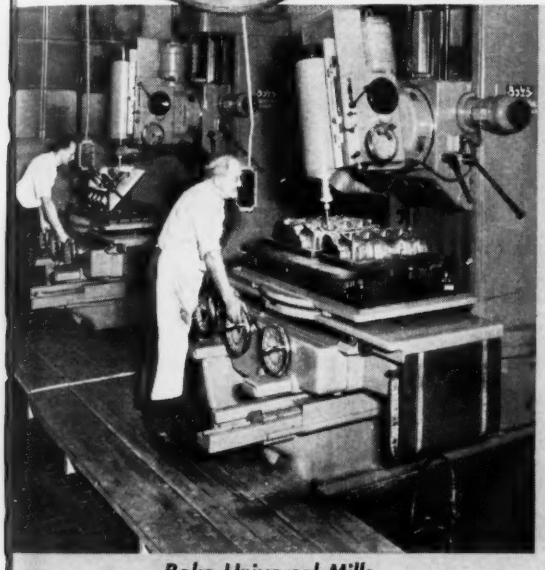
Complete Facilities

FOR FAST, ACCURATE, ECONOMICAL MACHINING

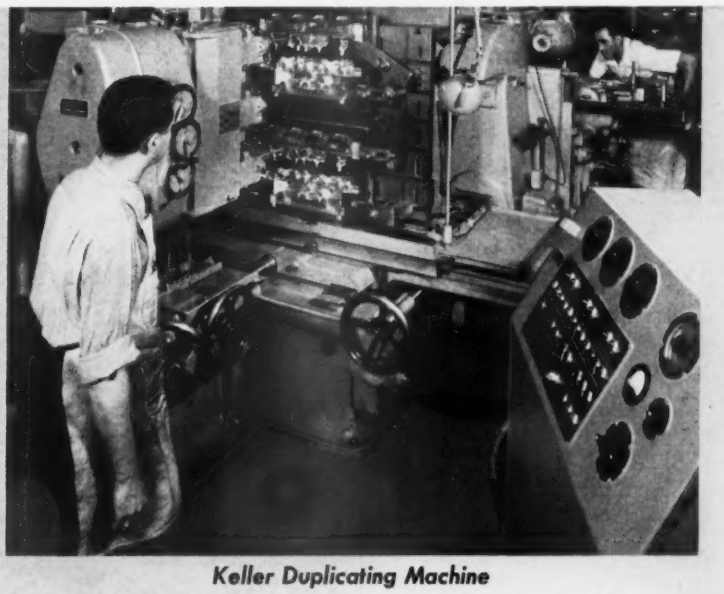
Whatever your machining needs, City Pattern Foundry and Machine Company has the complete facilities to do the job quickly, accurately and economically. Shown here are just four typical examples of the modern, comprehensive equipment that is ready and able to serve you.



Pratt & Whitney Jig Borer



Boko Universal Mills



Keller Duplicating Machine

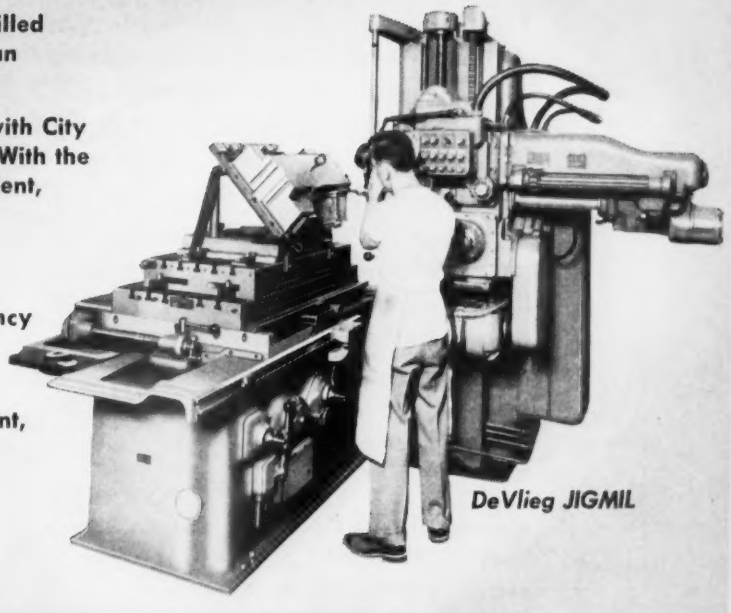
FAST—The full complement of equipment and experienced, skilled craftsmen at City Pattern Foundry and Machine Company are an unbeatable combination for prompt delivery of any job.

ACCURATE—Precision workmanship has been synonymous with City Pattern Foundry and Machine Company for the past 42 years. With the latest machines and a completely equipped inspection department, you are assured of accuracy that consistently meets your individual specifications.

ECONOMICAL—With the *right* equipment to do the job, City Pattern Foundry and Machine Company maintains peak efficiency and economy. No improvising is necessary. Time is used to greatest advantage.

In addition, we have a complete non-ferrous foundry department, including a shell mold section and a fully equipped testing laboratory ready to fulfill your casting needs.

Call or write for detailed information.



DeVlieg JIGMIL

CITY PATTERN

FOUNDRY AND MACHINE CO.

PHONE TR 4-2000, 1161 HARPER AVENUE, DETROIT 11, MICH.

Powder-washing blowpipes have replaced swing grinders and chippers in removing defects and riser pads from railroad diesel trucks. Work is done faster and more efficiently—preheating is rarely necessary.

Powder-washing blowpipes remove riser pads in locations virtually impossible for other methods. Risers between flanges of this valve body have already been washed away—note the smooth clean finish.

Why Powder-Washing is a Standard Tool in Modern Foundries

Powder-washing is the fastest, most efficient method for gouging and removing fins, pads, and stubs from casting surfaces and hard-to-reach places.

* Powder-washing is faster than grinding or chipping, and finished surfaces are clean and smooth.
* Powder-washing tools are quiet, easy to operate, and less fatiguing than chipping tools and grinders.
* In powder-washing, metal powder is added to the washing flame. This raises its temperature, and provides greater speed and control in cleaning sand and metal from castings. This process is effectively used to gouge or wash iron, steel, bronze, and some of the more complex oxidation resistant alloys.

Your local LINDE representative will be glad to give you detailed information on the powder-washing process, and help you determine the setup to best serve your foundry needs. Save time and money—call him today.

LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
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Linde
TRADE-MARK

"Linde" is a registered trade-mark of Union Carbide and Carbon Corporation.

Now! TOCCO* Induction Melting Furnaces for Precision Casting

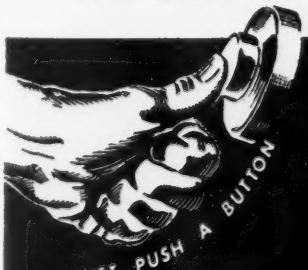
One of the TOCCO Induction Melting Furnaces used at Arwood Precision Casting Co. Note TOCCO control station in background.

● Engineers at Arwood Precision Casting Co. use TOCCO Induction Melting Furnaces for melting and remelting quality steel. Other companies have found TOCCO equally adaptable for melting non-ferrous metals. No wonder! *Look at the advantages:*

- ★ Stepless power control
- ★ Extremely Rapid Melting
- ★ High Efficiency on Intermittent Operation
- ★ Good Mixing because of Natural Agitation
- ★ Extremely Low Alloy Loss
- ★ No Carbon Pick-up
- ★ No Contamination when Composition of Charges is Changed
- ★ High Reproducibility of Results
- ★ Minimum Space Requirements
- ★ No Special Installation Charge
- ★ Simple, Safe Operation
- ★ Clean, Comfortable Working Conditions

If any of these advantages suggest economies in your operations write for full details—no obligation, of course.

THE OHIO CRANKSHAFT COMPANY



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*Trade Mark Reg. U. S. Pat. Off.

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THE OHIO CRANKSHAFT CO.
Dept. F-3, Cleveland 1, Ohio

Please send copy of "The Case for TOCCO Induction Melting."

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Position_____

Company_____

Address_____

City_____ Zone____ State____

Guarantee TOP Performance and Maximum Life!

Specify THESE TOP QUALITY FEATURES...

(Standard on Miller Cylinders at no extra cost)

Specify CASE HARDENED CHROME PLATED PISTON RODS

On all Air and Hydraulic Cylinders

Benefits To You

CASE-HARDENED Piston Rods (52-54 Rockwell "C") provide practically complete protection against damage from hammer blows, wrench-dropping, mishandling, and similar occurrences. ***Available from Miller at no extra cost.***

The HARD CHROME PLATING over the case-hardened rods protects against scratch-damage and rust. ***Available from Miller at no extra cost.***

Specify "TEFLON" WIPERS

On all Air and Hydraulic Cylinders

Benefits To You

"TEFLON" Rod Wipers and "TEFLON" Hydraulic Piston Rod Seals withstand temperatures from—100°F. to plus 500°F. They are impervious to practically all known chemicals, including the fire-resistant, special, and standard hydraulic fluids in current use. ***Available from Miller at no extra cost.***

Specify TEFLON HYDRAULIC ROD SEALS

On all Hydraulic Cylinders

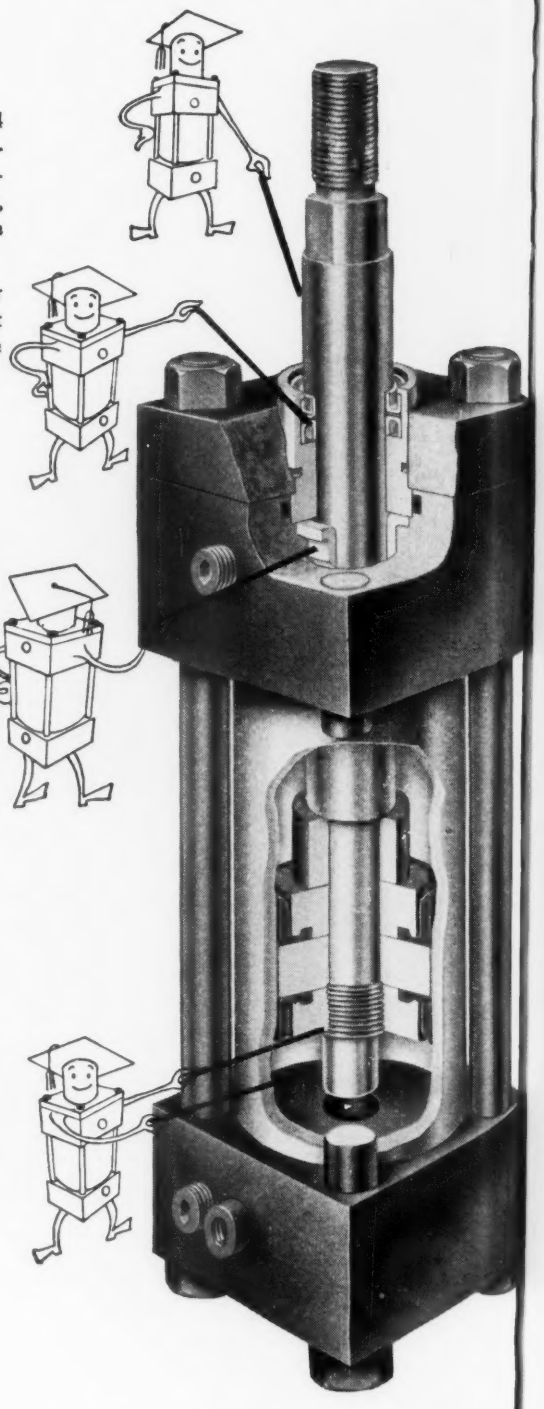
Specify RUST RESISTANT SURFACES

On all Air and Hydraulic Cylinders

Benefits To You

Highest quality Black Ferric Oxide Finish provides rust protection in air cylinder operation and on all cylinders during shipping and installation.

Cylinder heads, caps, mountings, pistons, followers, tie rods, and the unplated portions of the piston rods have this finish ***at no extra cost on all Miller cylinders.*** (This finish not recommended for water service)



You may wish to route this entire page to the proper department in your company, by using this handy form. Additional copies on request. →

To (Dept.) _____

"On all our future cylinder requirements, please specify the above quality features."

Signed _____

Title _____

See These New Features on Miller Cylinders at Miller

BOOTH #429

A. S. T. E. SHOW, March 19-23

International Amphitheatre, Chicago

MILLER FLUID POWER CO.

2034 N. Hawthorne Ave.. Melrose Park, Ill.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULAT
COUNTERBALANCE CYLINDERS

SALES AND SERVICE FROM COAST TO COAST

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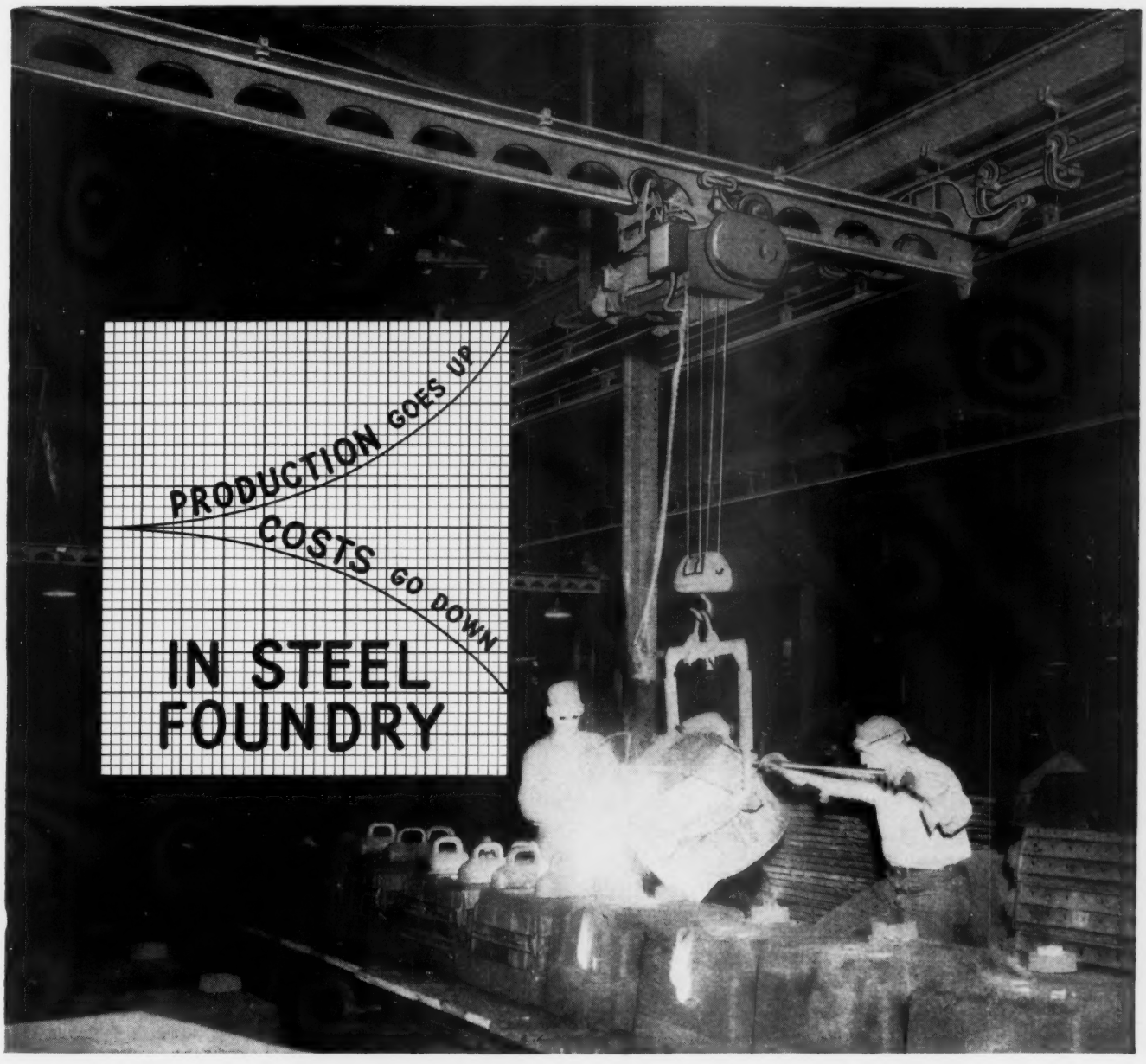
TORONTO, CANADA and OTHER AREAS



When a large Steel Foundry installed an overhead Cleveland Tramrail system to serve its pouring floor two significant things happened: (a) production increased greatly, (b) costs went down.

Factors contributing to these results were:

1. Enabled use of larger pouring ladles
2. Provided efficient working routine
3. Reduced delivery time of metal to molds
4. Decreased heat loss in metal
5. Eliminated much hand lifting, lugging and hard labor
6. Minimized worker fatigue
7. Promoted safety

Because of the phenomenal success with the pouring floor installation, Cleveland Tramrail was installed in other departments with equally remarkable results. In nearly every instance the equipment paid for itself within the first six months of operation.

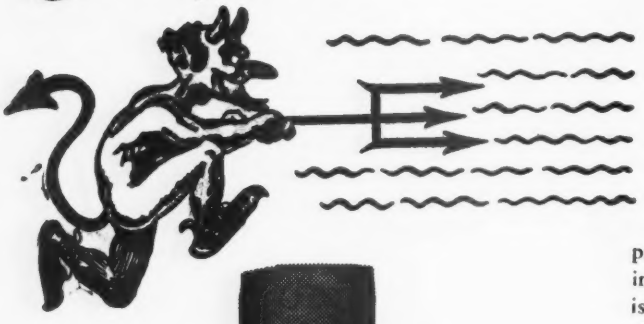
GET THIS BOOK!

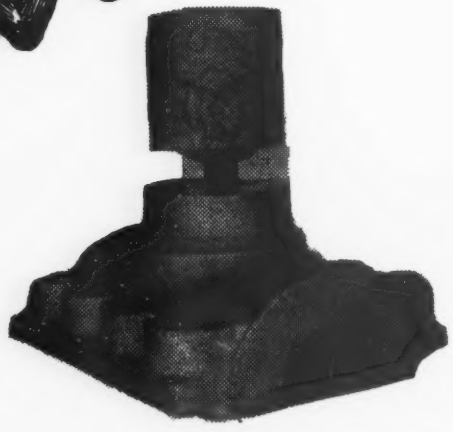
BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3804 East 286th St. Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

Soffel's





300 lb. aluminum bronze bearing cap cast with THERMOTOMIC feeding ring core under riser. Note small feeder opening which facilitates removal of riser from casting, resulting in greatly reduced cleaning costs.

NOTE THESE TYPICAL RESULTS FROM THE USE OF SOFFEL'S *Carbon Free* LIQUIDIZER

With the application of 1 pound of SOFFEL'S CARBON FREE LIQUIDIZER, this 6" x 6" chrome-nickel-steel riser was reduced in weight from 32 pounds to 13 pounds average. A savings of 19 pounds of salable metal, normally discarded as scrap, was fed into the casting and produced a heavier, sounder casting. Note the feeding head can be knocked off easily, saving burning costs. There is no better feeding head compound at any price than SOFFEL'S CARBON FREE LIQUIDIZER.

THERMOTOMIC® COMPOUND and CARBON FREE LIQUIDIZERS

Keeps Metal Molten!

for Steel, Iron, Aluminum

Brass, Bronze, Copper

THERMOTOMIC "X" is a patented exothermic compound that produces a temperature over 3500° F. It can be molded or baked into any desired shape the same as sand cores. THERMOTOMIC "X" is used as knock off core rings with 1½ inch feeder opening under risers of feeding heads, also as insulating sleeves, inserts and facings, or mixed with facing sand where it is desired to maintain fluidity of the casting metal. Shorter and more compact heads and risers can be used. The small feeder opening permits easy removal of feeding heads and risers. In conjunction with THERMOTOMIC COMPOUNDS, we recommend the use of exothermic CARBON FREE LIQUIDIZER NO. 5 on top of the metal in the heads or risers as an insulating cover. For green sand casting molds, use THERMOTOMIC WP (Waterproof).

U. S. Patents No. 2,490,327 and No. 2,500,097

THERMOTOMIC *Strainer Core* PRODUCES MONEL CASTINGS 270 LBS. SOLID

Made by direct pouring through the Thermotomic strainer core under the feeding head.

No chills were used, no shrinkage at the flange. Note depth of shrinkage in the feeding head.

BEWARE OF IMITATIONS! We are the originators of CARBON FREE LIQUIDIZER and THERMOTOMIC COMPOUNDS

PITTSBURGH METALS PURIFYING COMPANY

World's Largest Manufacturer of Fluxes and Purifiers For All Metals and Alloys

1352 MARVISTA ST., N. S. PITTSBURGH 12, PA.

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THERE'S a NORBIDE Nozzle available to give you exactly the type of cleaning stream you need — from a broad stream for large areas to a pencil-thin stream for cleaning small openings. And NORBIDE Nozzles — lined with the hardest manufactured material commercially available — maintain stream contour, last longer than any other nozzle made and deliver maximum blasting efficiency at minimum cost per hour.

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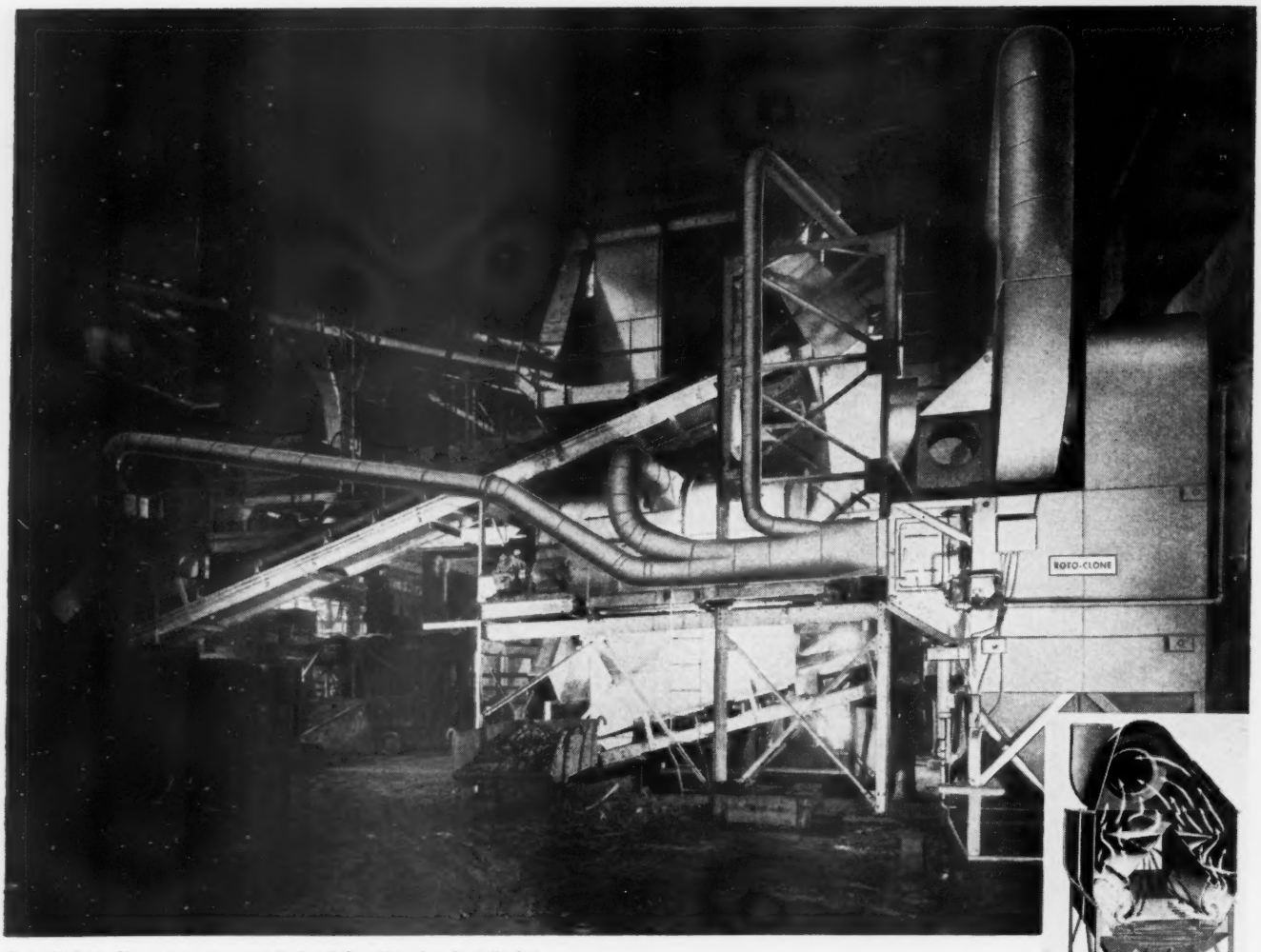


Type N Roto-Clone Arrangement D Sand Conditioning Installation.

Type N Cut-away Roto-Clone

A MAN-HOUR SUPPLY *worth thinking about!*

AAF ROTO-CLONES IMPROVE WORKING CONDITIONS BY ELIMINATING DUST AND FUMES

Human efficiency and willingness to work are intangible factors that have a decidedly "tangible" effect on production schedules. Modern foundries find that improved working conditions through the elimination of dust and noxious fumes by AAF Roto-Clones*, measurably increases efficiency as well as measurably reducing absenteeism and labor turnover.

One-third of the foundry's dust occurs in sand conditioning systems like the one above. The Type N Roto-Clone shown is a hydro-static precipitator of high efficiency which removes dust by dual washing and scrubbing action and combines in one unit all three functions of exhausting, separating, and storing dust . . . in the form of sludge.

The complete line of AAF Roto-Clones offers a wide selection of performance and operating characteristics that will efficiently control every dust source. For the correct solution to your dust or air pollution problems call your nearby AAF representative or write direct to American Air Filter Company.

**ROTO-CLONE is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.*

AAF herman nelson

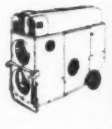
American Air Filter

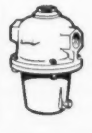
COMPANY, INC.

226 Central Avenue, Louisville 8, Kentucky

American Air Filter of Canada, Ltd., Montreal, P. Q.

Herman Nelson Portable Heaters





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BETTER AIR IS OUR BUSINESS

AAF Electric Furnace Hoods

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Coming in May

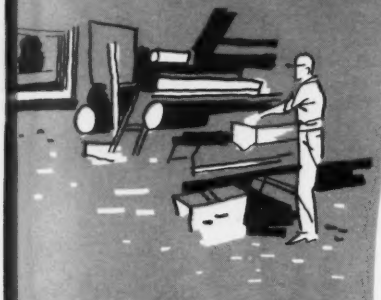
FOUNDRY

60th

Pre-Convention Issue

A SPECIAL EDITORIAL REPORT

The Tools for Tomorrow's Foundry Progress



The editors of FOUNDRY announce presentation of a special discussion of this important subject—viewed from five "key angles." This year's report will discuss developments and trends in these particular areas:

1. **FOUNDRY TECHNOLOGY**— significant foundry developments of the past two years and an estimate of those which appear destined to have the most pronounced effect on future foundry progress.
2. **FOUNDRY PRACTICE**— what have been the trends in foundry mechanization, modernization, automation?
3. **MANAGEMENT LEADERSHIP**— a report and discussion of how foundry management is preparing to meet the competitive demands of tomorrow.
4. **EQUIPMENT and SUPPLIES** — foundry suppliers will state the direction of trends in machines and materials in the next ten years as they see them.
5. **FOUNDRYMEN TELL WHAT THEY WANT**— what types of machines, supplies and services do foundrymen want from the equipment manufacturers?

Watch for this SPECIAL REPORT in the May issue . . . . . .

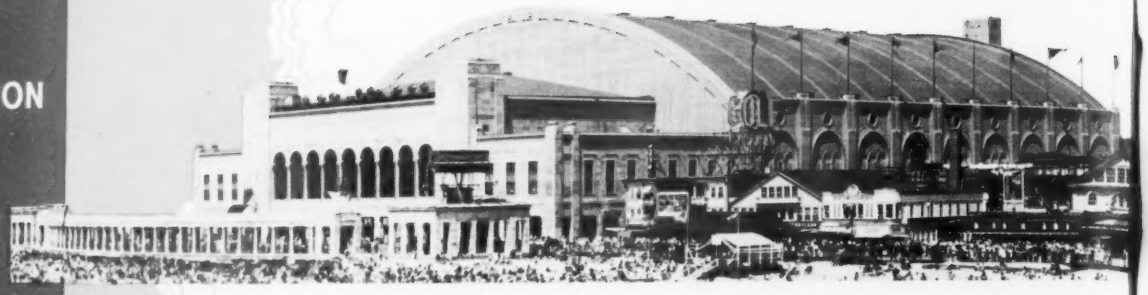
FOUNDRY

A Penton Publication

60th
ANNUAL CONVENTION AND SHOW

AMERICAN FOUNDRYMEN'S SOCIETY

ATLANTIC CITY
May 3 to 9, 1956



FOUNDRY

PRE-CONVENTION ISSUE

MAY, 1956

The May Pre-Convention issue of FOUNDRY will be mailed one week earlier than usual to reach foundrymen well in advance of the opening of the Atlantic City convention.

FEATURING:

✔ **Tools for Tomorrow's Foundry Progress:**

A 5-part special editorial report.

✔ **AFS Congress and Exhibit:**

Outline of Technical Program and other Congress Features, Awards Winners, Equipment and Supplies Exhibitors and their New Products.

✔ **Feature Stories:**

The regularly scheduled feature stories characteristic of each issue of FOUNDRY will appear as usual in this issue.

✔ **Departments and other features:**

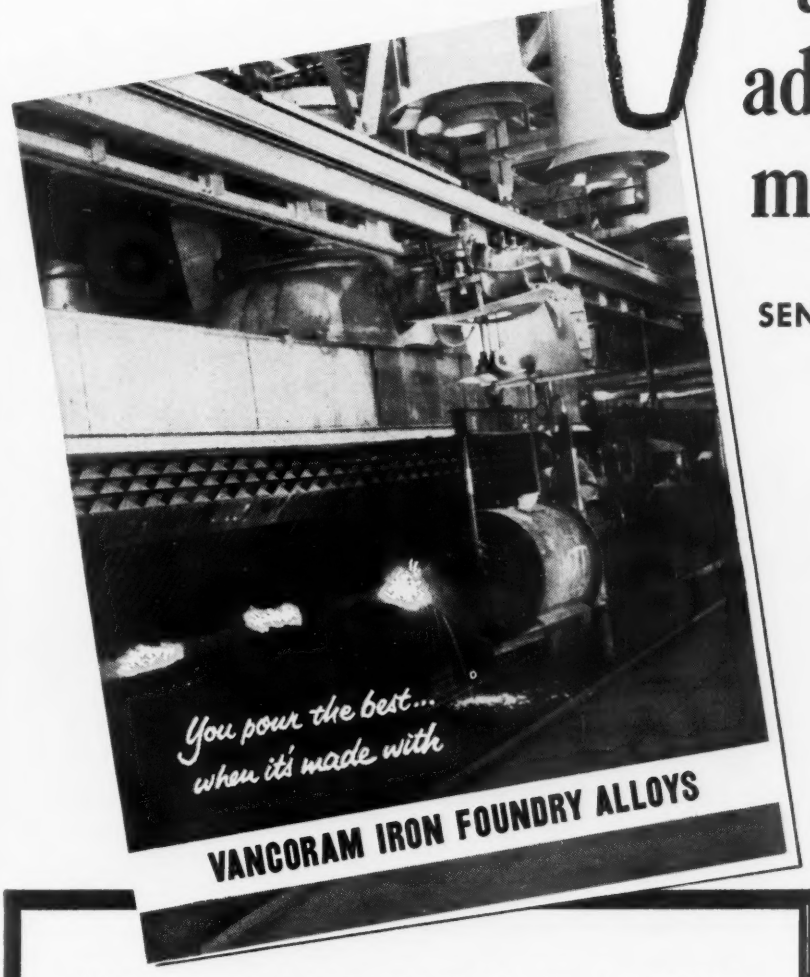
Questions and Answers, Late News, Foundry Developments, and all other regular departments will appear as usual.

And in June... **POST-CONVENTION ISSUE**

The news and picture report of the Atlantic City convention and technical sessions will be a special feature of the June Post-Convention issue of FOUNDRY.

FOUNDRY—A Penton Publication · Penton Building · Cleveland 13, Ohio

an important addition to your metals data file...



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It's perfect for purchasers, technical and executive personnel who want a handy, quick-reading brochure that covers Vancoram alloys for the Iron Foundry.

In it you'll find the composition of the principal Vancoram alloys and a clear, quick analysis of their recommended uses. Other helpful material includes shipping information and explanation of VCA's color-coding system of alloy identification.

Send for your free copy today. Jot down your name and address on the attached coupon. The new Vancoram brochure is just one more way VCA works to serve you better on this, our fiftieth year of service to the metals industry.

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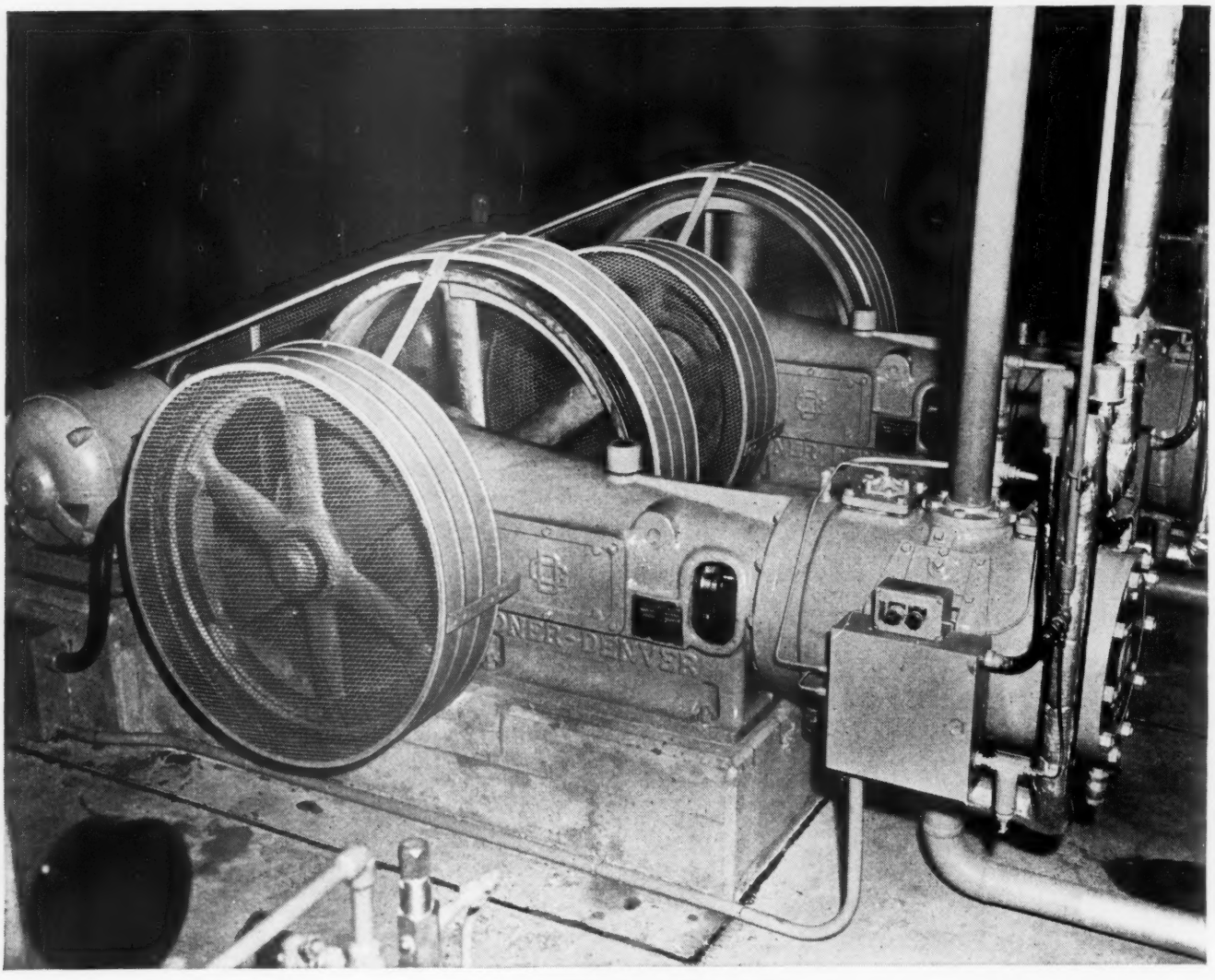
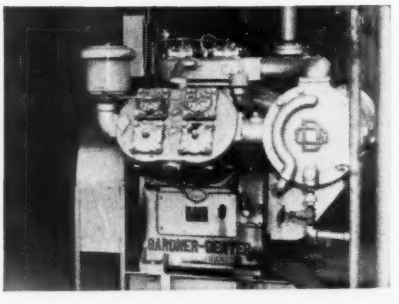


Built for the 168-hour week . . . Gardner-Denver RX Compressors

That's *continuous* service . . . and it goes on year after year in all sorts of plants where Gardner-Denver RX's occupy the compressor room. Bearings, valves and other moving parts are engineered to keep on the go . . . seldom require more than brief inspection halts. Bulletin HAC-40 gives details on RX models from 89 to 1292 cfm, for pressures from 15 to 150 psi. Write today.



Another popular industrial compressor . . . the compact, efficient Gardner-Denver WB. 142 to 1150 cfm.

GARDNER - DENVER

THE QUALITY LEADER IN COMPRESSORS, PUMPS, ROCK DRILLS AND AIR TOOLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

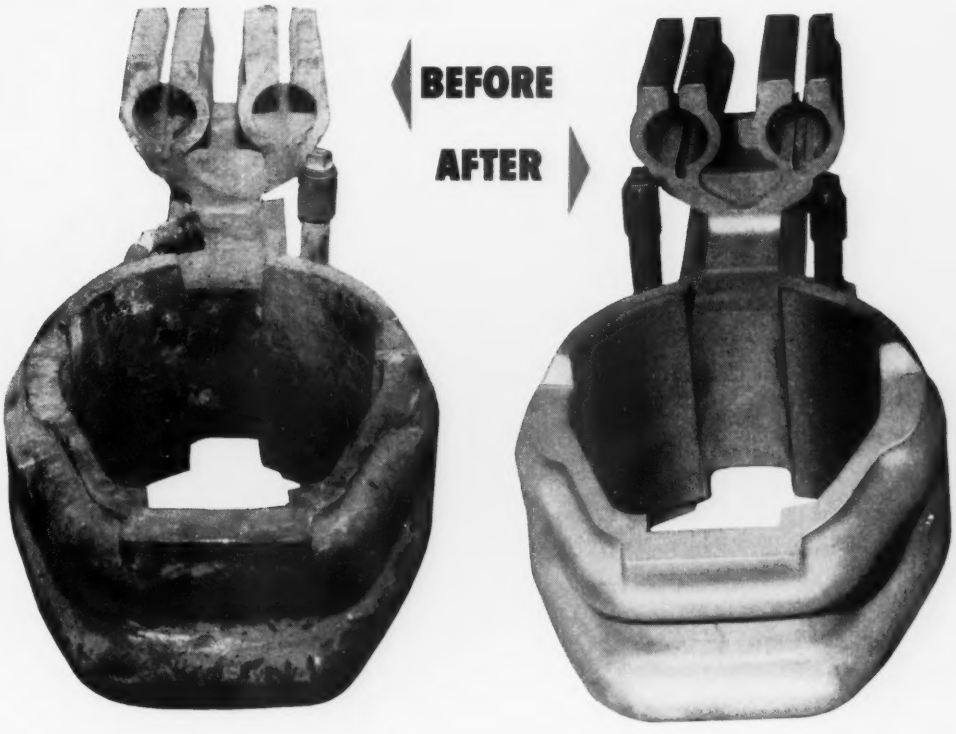
Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

GARDNER-DENVER Since 1859

KELLER TOOLS

Rebuild ELECTRODE HOLDERS

at a fraction of replacement costs...



Costly electrode holders, bus tubes and cable clamps no longer need be discarded when they become badly burned, pitted or scarred. These pieces of equipment may be restored to a condition corresponding to the original drawings and specifications at a fraction of the cost of a replacement unit. Wilson Welding Company's new method, using a patented process of fusion welding of copper and copper alloy, now makes possible the repair and rebuilding of holders, bus tubes, bus bars or other burned or damaged copper component parts on all types and makes of electric arc melting and smelting furnaces.

The photographs above show, in a graphic manner, the results obtained from an electrode holder so badly damaged that it was thought to be unsalvageable.

Repair prices are based upon the amount of labor and material cost involved.

All repair work is guaranteed to produce a finished product comparable in every respect to the original.

Your inquiry will receive prompt attention.

W W CO INC

Wilson Welding Company, Inc.

COPPER AND COPPER ALLOY WELDING

221 HIGH STREET
ALTIZER ADDITION
BOX 1634
HUNTINGTON
WEST VIRGINIA

For more information, use Reader Service Card, page 201

(A CASE HISTORY)

BETTER SAND

FOR BETTER CASTINGS

T. B. Wood's Sons Company, Chambersburg, Pennsylvania specializes in sheaves and pulleys. All sizes must be cast from a single sand. The section changes make scabs a problem. Extensive machining requires minimum stock and elimination of excess stock and overweight castings. Even the largest castings are poured in green sand to eliminate drying costs and to promote easy shake-out and sand reuse. Plasti-Bond, the sand additive developed in connection with high-pressure molding, provides the peel, the finish, the flowability and workability and controls expansion problems.

MINERALS International CHEMICALS

EASTERN CLAY PRODUCTS DEPT.

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

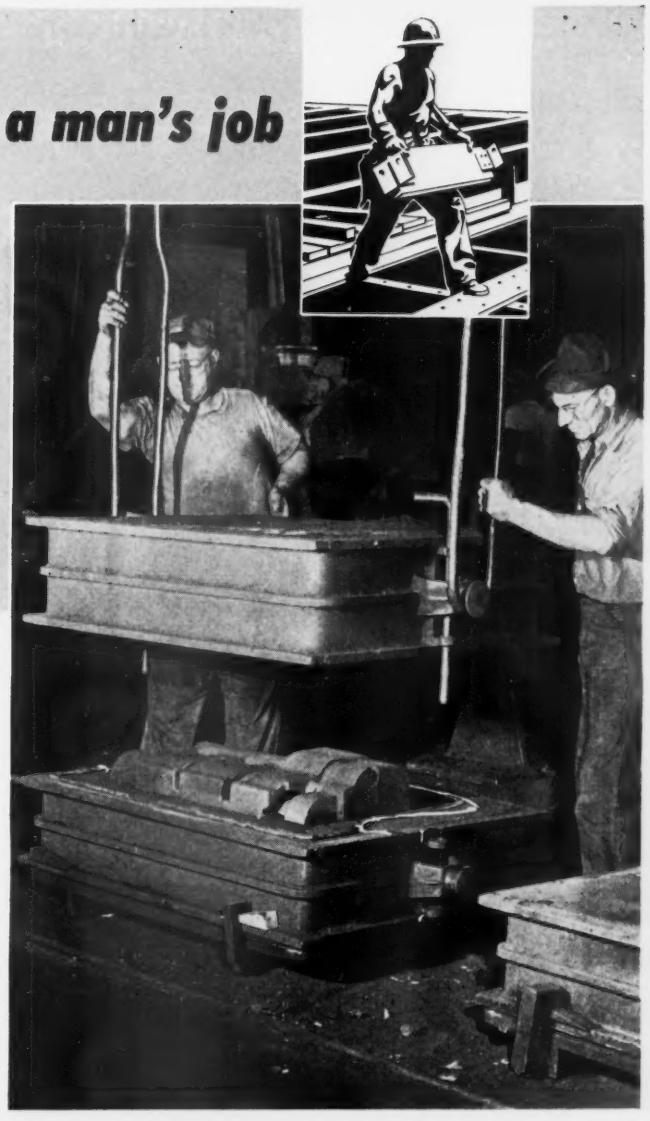
General Offices: 20 North Wacker Drive, Chicago 6

DIXIE BOND • BLACK HILLS BENTONITE • TRIPLACT • REVIVO CORE PASTE • REVIVO BOND • BONDACTOR • CUPOLINE • DURA PRODUCTS • WESTONITE

For more information, use Reader Service Card, page 201

You'd send a man to do a man's job
So, specify

BS&B
Heavy Duty
FOUNDRY FLASKS
for heavy, tough service



The only heavy duty foundry flask combining all these advantages is manufactured by BS&B

1. Welding of bearing strips continuously, both inside and out.
2. Cast steel trunnions.
3. Cast steel pinlugs and clamplugs.

Write for FREE BS&B Foundry Flask Handbook

A handy catalog and useful foundryman's "Bible"... includes valuable information on foundry flasks and easy-to-order system.

Foundry Flask Division, Dept. 7-AR3

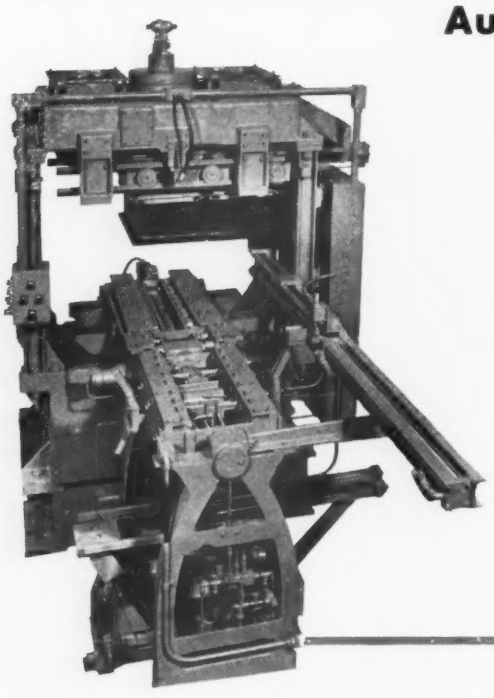
A boy can't do the job of a man any more than a lightweight flask can do a foundry job calling for a heavier one. And there's a difference in heavy duty flasks, too! You may even find BS&B Foundry Flasks initial cost a little more; but their actual cost is low . . . low maintenance will soon make up the difference . . . you'll get years of economical service from these time-proven work horses. BS&B methods of corner forming of walls and bearings separately, plus welding bearings to walls, both inside and out, eliminates corner stresses, preventing the corners from cracking and breaking out. Production and maintenance records maintained by many foundries prove that BS&B Foundry Flasks pay for themselves many times over in the money and time they save on minimum maintenance.

BLACK, SIVALLS & BRYSON, INC.

7500 East 12th Street — Kansas City 26, Missouri

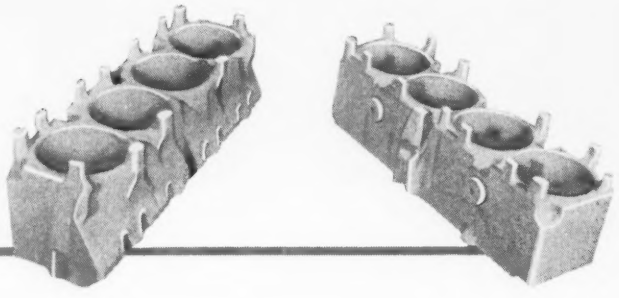
FOUNDRY — OUR 60TH YEAR — BS&B — FLASKS

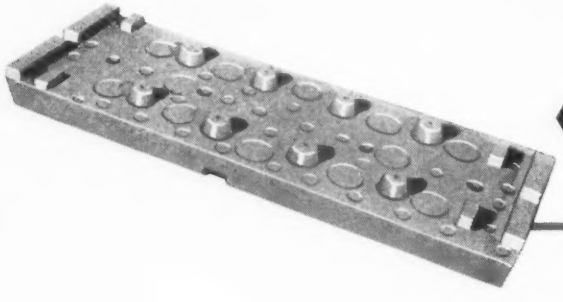
The Sutter "Mechanicore" Model SP-221 Automatic Core Blower



This machine is shown in operation on the opposite page. Featuring double heads, it is also equipped with the Sutter Automatic Double Rollover Core Draw Machine with push-out device and the Sutter Automatic Transfer Device which moves blown cores from blower to draw machine. Many variations are possible. Two draw machines can be used, one on each side of a blower, or a circular indexing setup can be used. In every case, one core can be blown while another is being drawn. Core boxes have been removed to show the unique design.

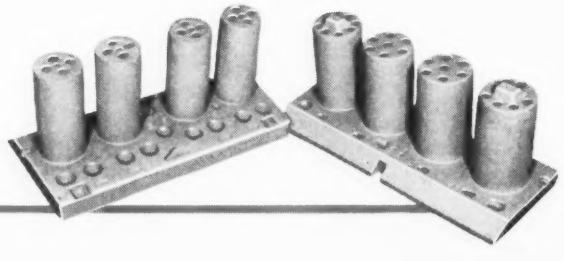
Right- and left-hand water jacket cores. Produced on Sutter SP-221 Core Blower with SP-541 Rollover-Draw Machine with side drawbacks. "Mechanicore" operation produces ten times the production of previous method.





Slab Core. Produced on Sutter Model SP-220 Core Blower equipped with SP-510 Rollover-Draw Machine and core box transfer device. One operator produces 180 of these hourly.

Barrel Cores. One man operation including spraying cores and placing them in oven. Putting this job on Sutter SP-221 Core Blower with SP-520 Rollover-Draw Machine increased production 4 to 1.



SUTTER

SUTTER PRODUCTS CO.

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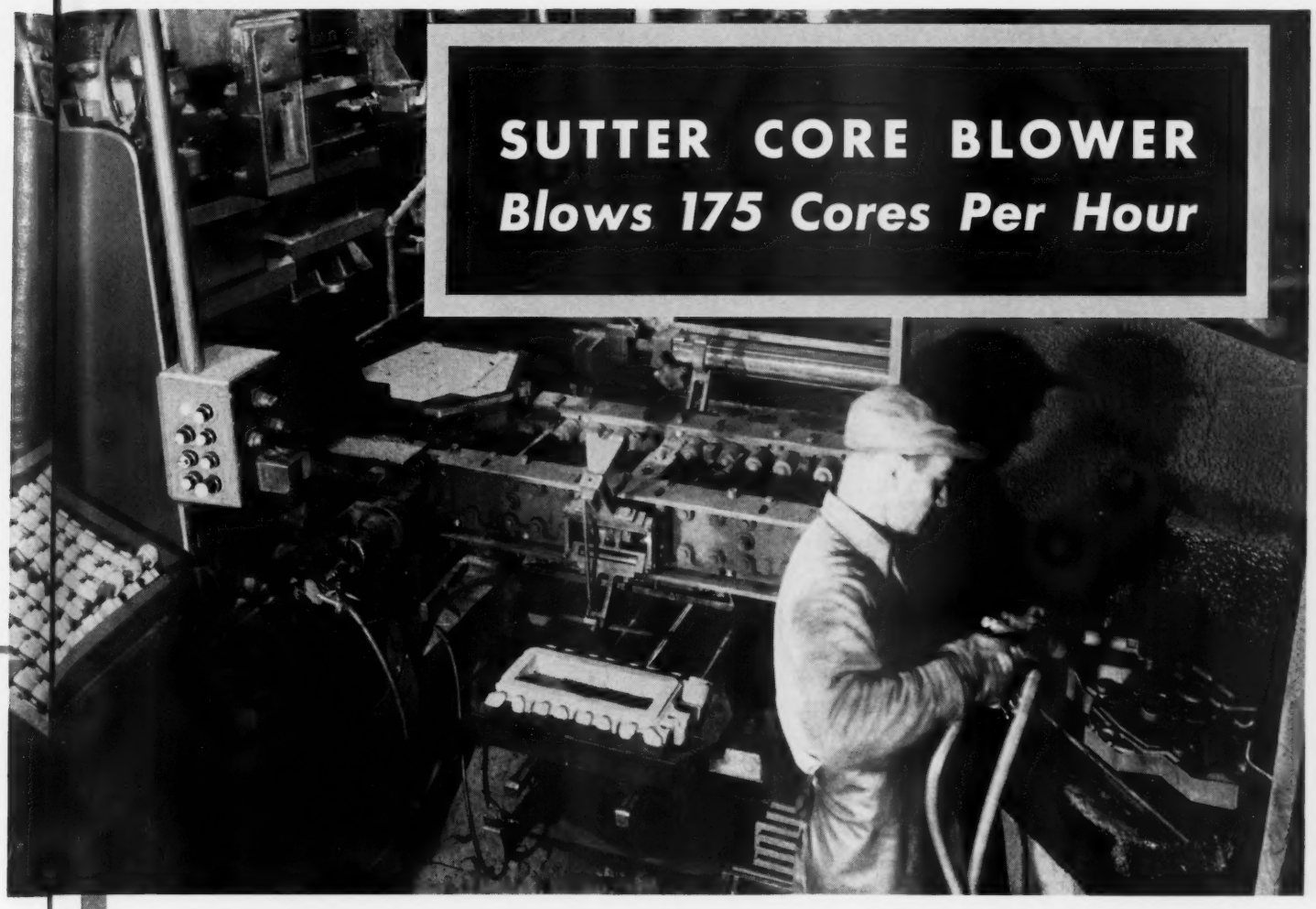
Canadian and Overseas Mfr. & Dist'r.

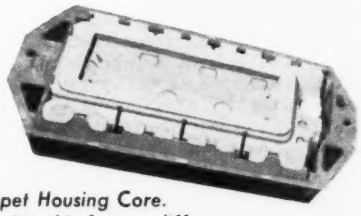
Foundry Equipment Limited — Leighton Buzzard, Bedfordshire, England



SUTTER CORE BLOWER
Blows 175 Cores Per Hour

2 Different Cores . . . 2 Different Sands!

Gear Cover Core, shown in the action picture above, moving to rollover to be drawn automatically.



Tappet Housing Core. Forming this from a different sand is no problem with versatile Sutter equipment.

Here's real core blowing flexibility . . . the kind that can pay off *for you* in easier production scheduling and extra core output!

This Sutter Dual Head "Mechanicore" is in operation at Holmes Foundry Company, Ltd., Sarnia, Ontario. Holmes is one of Canada's leading suppliers of gray iron castings for the automotive industry. The machine blows a gear core and a tappet housing core alternately, *using a different sand for each core.* The entire cycle is automatic, requiring only unloading by the operator. This leaves him free to spray finished gear cores as shown, place them in a core rack and also set a paste-in core in the tappet housing core before placing it in a rack. Core production is 175 per hour.

The Sutter Dual Head "Mechanicore" design offers such profitable alternatives as: (1) Use both heads for the same core to increase production, (2) Maintain full production, as shown, on two different cores, (3) Use either head as a single blower to switch production quickly when needed.

Sutter builds a variety of standard model machines, also designs and builds custom units. Consult our engineers, entirely without obligation, or send for technical bulletins.

SUTTER PRODUCTS CO.

2005 WESTWOOD AVE. • DEARBORN, MICH.

SUTTER

Canadian and Overseas Mfr. & Dist'r.

Foundry Equipment Limited — Leighton Buzzard, Bedfordshire, England

FOR **EASIER... BETTER** SAND CONTROL USE

DELTA

SCIENTIFICALLY DEVELOPED FOUNDRY PRODUCTS

DELTA PERMI-BOND

SEA COAL REPLACEMENT IN MOLDING SAND

DELTA PERMI-BOND is a revolutionary development which eliminates the use of SEA COAL . . . and its inherent disadvantages . . . in molding sands.

It is a specially prepared pure hydrocarbon, completely volatile at elevated temperatures. It decomposes to form a vapor-gas cushion, which is reducing in nature, and leaves only a trace (two-tenths of 1% maximum) of ash.

NOTE THESE IMPORTANT ADVANTAGES . . . 1. Always uniform. 2. Eliminates sand contamination. 3. Greatly reduces gas, smoke, soot and dirt in the foundry. 4. Provides correct amount of vapor gas in the mold cavity to prevent casting blows. Allows use of lower permeability sand. 5. Increases dry strength of sand 75% to 90%. 6. Prevents scabbing, buckling, rat-tailing and cutting which greatly reduces scrap castings. 7. Improves casting finish, cuts cleaning room costs to a minimum. 8. More economical to use; reduces your sand costs. 9. Much cleaner and more foolproof to use than sea coal.

DELTA DRI-BOND

IN CORE SAND

DELTA DRI-BOND BINDER is a product of several years of research and experimentation in our own sand research laboratory and proved by additional years of actual experience-in-use data compiled by prominent foundries. The excellent results obtained with Delta Dri-Bond Binder, reported by all sources, establish beyond question both the outstanding superiority and greater economy of this new product for use in steel, gray iron and non-ferrous foundries.

In recent tests, conducted by impartial personnel, it was definitely proved that Delta Dri-Bond Binder has (a) — higher tensile and compression strength, (b) — much greater waterproofing properties and (c) — considerably higher green strength and hot strength than other dry binders tested.

DELTA SAND CONDITIONING OILS

FOR CORE AND MOLDING SANDS

DELTA SAND CONDITIONING OIL is a very fluid organic liquid with a light greenish color cast. It has a very low surface tension and acts as a lubricant in sand mixes. It improves the flowability and workability of both molding and core sand mixes. Its greatest use is in core sand mixes where, in addition to improving the flowability of the sand, it helps eliminate sand sticking to the core boxes.

It has proven exceptionally useful in the elimination of core sand sticking problems in plastic resin core sand mixes.

DELTA

Get the Facts . . . Working samples and complete literature on Delta Foundry Products will be sent to you on request for test purposes in your own foundry.

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN

TAXE$ . . . earned by brick

If you own securities . . . if you're paid a salary . . . if you earn commissions . . . no matter how you make your income, the starting point is brick. Refractory brick.

Refractories, the industry behind industry. Refractories that contain and control flame . . . the flame that produces metals, glass, paper, rubber, oil, cement, power, transportation. Everything that's made or moved requires them.

But those requirements vary . . . vary over a vast range of applications. To provide them in almost infinite variety and enormous quantity, Grefco employs extensive research, maintains the world's most modern refractories laboratory, and supplies a Complete Refractories Service from strategically located plants, both here and abroad, that draw on the world for materials.

A Complete Refractories Service
GENERAL REFRACTORIES COMPANY
Philadelphia 2

SEND FOR THE MOTION PICTURE: THE GREFCO STORY

It is a beautiful 16 mm. motion picture in full color and sound which relates the fascinating and little understood story about the refractories industry... *the industry behind industry.* Viewing time is 26 minutes. If you would like to show it to executive, employee, social, church or other groups, a request on your letterhead is all that is necessary. Address General Refractories, Philadelphia 2.

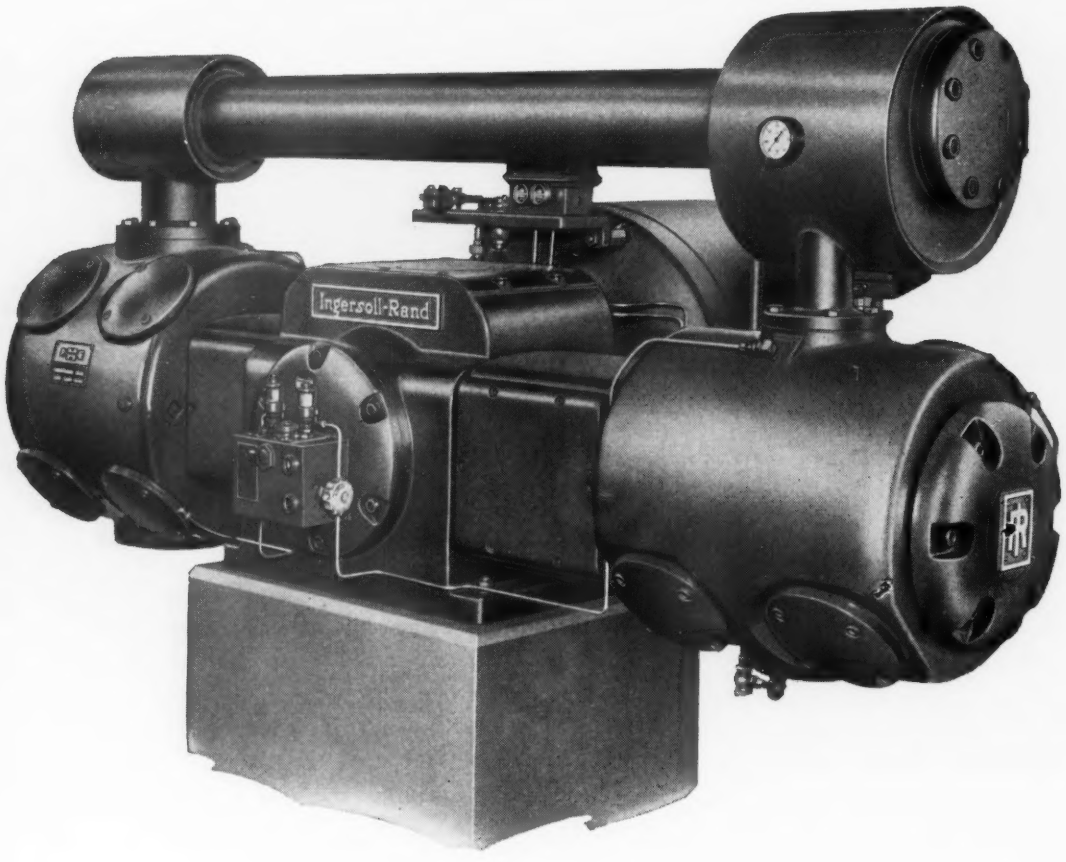
GENERAL REFRACTORIES

NEW

OPPOSED-CYLINDER

BALANCED DESIGN, TYPE PHE

COMPRESSOR



COMPACT, SPACE-SAVING PACKAGED DESIGN

The new, space-saving PHE design marks another Ingersoll-Rand achievement in electric-driven compressors. Built for continuous, heavy-duty service, it includes the following outstanding features: Opposed pistons with excellent running balance — Efficient tube-type intercooler—New cylinders with Type A Channel Valves—Motor mounted directly on crankshaft—Full floating aluminum main and crank-pin bearings — Sealed crankcase — Force-feed lubrication.

FOR EASY SHIPMENT, INSTALLATION & RELOCATION

Shipped completely assembled and ready to run, the PHE compressor can be easily installed—in very little floor space—with a minimum of piping—and on a simple inexpensive foundation. Relocation, if required, is equally simple.

ELECTRIC-DRIVEN 75 AND 100 HP SIZES

The basic design is a two-stage unit for 80-125 psi. For other pressures, or for pumping vacuums, alternate cylinder arrangements can be supplied. It will pay you to get all the facts on this new, cost-saving design. Ask for Bulletin No. 3155.

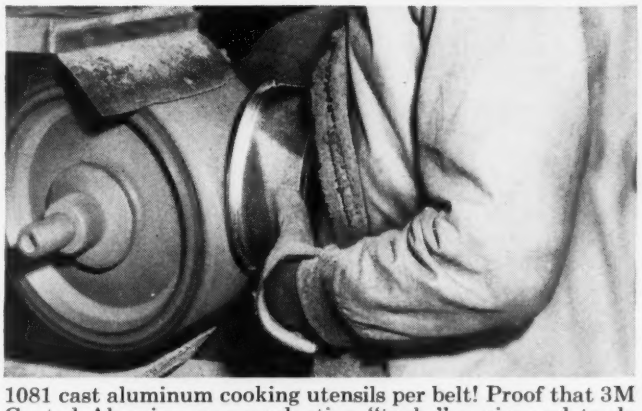
Ingersoll-Rand

1-105 11 Broadway, New York 4, N. Y.

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

3M METHOD—better from start to finish

3M Representative helps aluminum foundry cut abrasive belt costs 54%



1081 cast aluminum cooking utensils per belt! Proof that 3M Coated Abrasives are production "tools," engineered to do better, faster grinding and finishing at lower cost to you.

Although Century Metalcraft Corp., Los Angeles, Calif., was satisfied with the way Three-M-ite Cloth belts were grinding the bottoms of "Guardian Service" cast aluminum cooking utensils, a 3M Representative saw a way they could profit by switching to "Wetordry" Type Belts. The new belts lasted so much longer that belt costs were cut 54%.

The 3M Representative also suggested using a Resin type belt for the finishing operation. Result: production per belt increased over 100% . . . from 461 to 1081.

Keeping customers up-to-date is an important job for the 3M Representative. Remember, he's a coated abrasives expert who can help *you* cut costs and increase production in *your* foundry. Send coupon today for additional information.

3M ABRASIVE BELTS

Made in U.S.A. by Minnesota Mining and Mfg. Co., St. Paul 6, Minn.—also makers of "Scotch" Brand Pressure-Sensitive Tapes, "Scotch" Brand Magnetic Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Adhesives. General Export: 122 E. 42nd St., New York 17, N.Y. In Canada: London, Ont., Can.

Send today for **FREE** *Booklet*

Minnesota Mining and Mfg. Co.
Dept. CN-36, St. Paul 6, Minn.

☐ Send me free booklet on finishing non-ferrous metals
☐ I'd like to talk to a 3M Representative

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

Although maligned in folklore as a bird of ill omen, and in comparatively recent times persecuted by farmers and hunters, it is now quite common knowledge that the owl is a valuable ally of the farmer. By night, it takes wing to do greater execution than scores of traps. Rats, mice, bats, grasshoppers, beetles and other insects make up its fare. From a purely economic standpoint, it would be difficult to name a more beneficial bird.

WISDOM

The owl's only claim to wisdom is based on ancient Grecian mythology, together with an attitude and mien suggestive of deep thought. Nevertheless, this solemn bird is generally regarded as the symbol of wisdom.

However, there's nothing mythical about the sound judgment that prompts the selection and use of HINES FLASKS. When it comes to choosing flasks for routine or difficult casting jobs, foundrymen demonstrate clear thinking by selecting HINES FLASKS. For there's no other foundry equipment in which they can invest that will pay them more substantial dividends.

So why not be smart? Next time you're in the market for flasks—be sure to investigate HINES FLASKS.

HINES FLASKS

HINES POP-OFF FLASK

THE HINES FLASK CO.,

3431 WEST 140TH STREET, CLEVELAND 11, OHIO • TELEPHONE: ORCHARD 1-2806

Report on the new MICHIGAN 12B

Power-shifting makes this new tractor shovel

faster and more maneuverable in boxcars

If you've ever tried to shift gears and turn a corner at the same time, you'll understand why the new Michigan 12B is faster and more maneuverable in tight quarters. *You don't have to stop to shift the 12B.* Without taking your left hand from the wheel, you simply push the single power-shift lever to High, Low or Reverse—instant shifting, just like a new car.

Speeds cycles. Clark's exclusive power-shift transmission and torque converter completely eliminate the clutch pedal and engine clutch; no gear clash, no hesitation.

Power-shifting saves seconds or minutes on every cycle, in addition to eliminating down-time due to clutch trouble.

Dust protection. Oil bath air cleaner, filters and sealed assemblies protect the 12B against dust and dirt in every conceivable way. Take a first-hand look at this modern Tractor Shovel—clip the coupon to your letterhead and we'll arrange a demonstration in your own plant.

Available on Clark's no-down-payment Lease Plan; write for Data Sheet 111.

Michigan is a trade-mark of

CLARK EQUIPMENT

Arrange demonstration of Model 12B:

CLARK EQUIPMENT COMPANY
Construction Machinery Division
2475 Pipestone Road
Benton Harbor 3, Michigan

why trust to luck?

In the choice of a core oil, Penolyn eliminates any element of chance. This proven product, of superior quality, gives maximum efficiency, and is designed for the exacting requirements of Foundry and Core Room practice. It's good horse-sense to—

specify PENOLYN CORE OIL

for these 10 important casting advantages:

1. Dependable uniformity
2. Concentrated form
3. No obnoxious odor
4. Seepage eliminated
5. No crusting, green mix
6. Always clean working
7. Wide temperature range
8. Polymerized formulation
9. Minimum gas
10. Ample collapsibility

If you require expert technical assistance or technical data regarding your present or future casting operations, just call the Penola Office nearest you.

Penola

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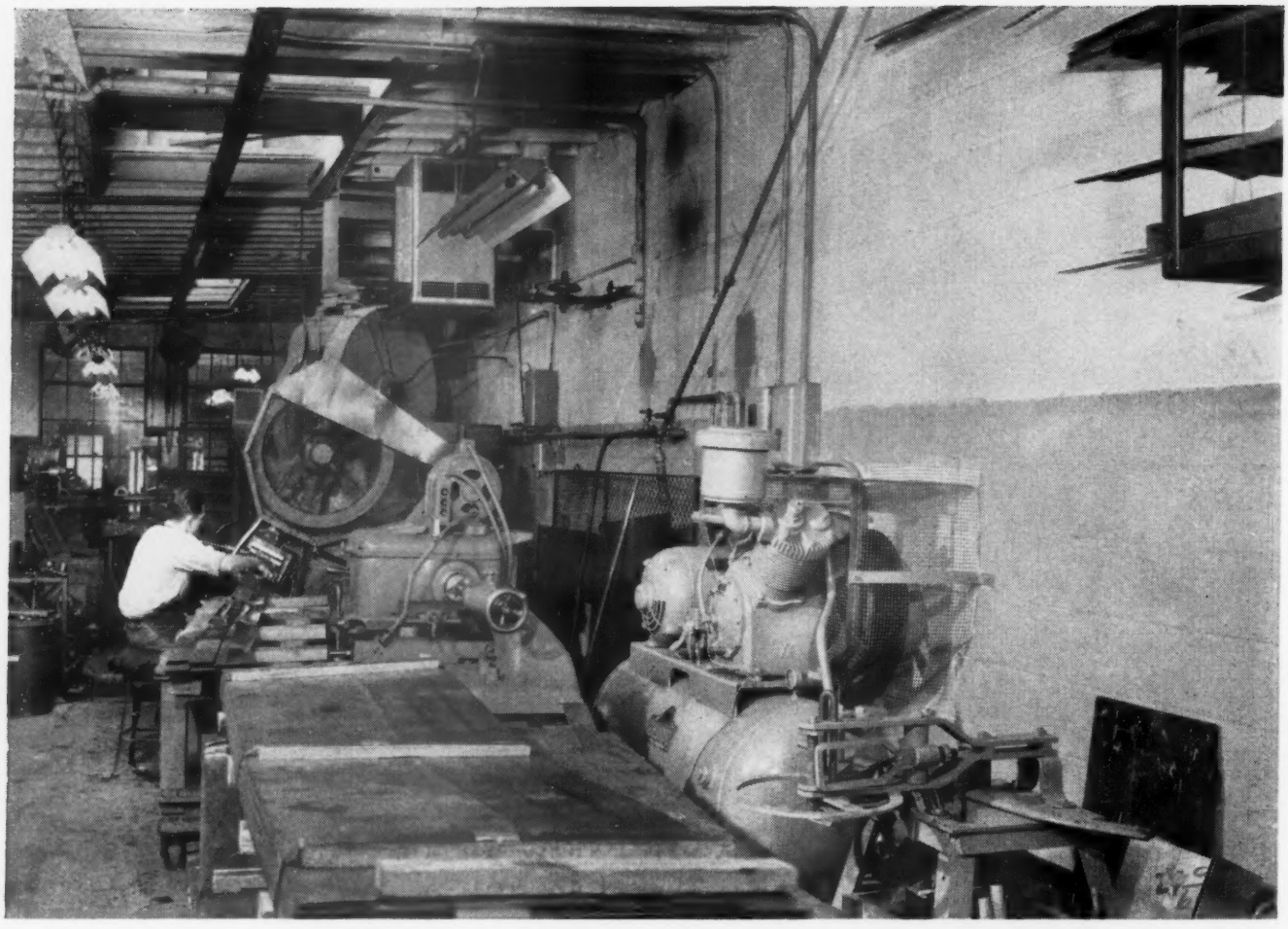


Punching Out Extra Profits

Dependable Westinghouse Air Compressor supplies versatile, economical air power to raise production and lower costs

That's just what the operator of this punch press is doing — punching out the extra profits that result from increased production.

And it's a Westinghouse Air Compressor that's responsible for his greater output.

Why? Because Westinghouse Air Compressors have 15 features not found in any other compressor — features that mean greater dependability and greater efficiency for low-cost operation. Here they are:

Type M inlet filter, disc valves, enclosed crankcase, anti-friction main bearings, pressure lubrication, low oil level protection, enclosed starting unloader, adequate cooling fins, "Y" type construction, high velocity fly-wheel fan, large size intercooler, thermal overload protection, greater weight, dual control, and one-year warranty period.

Let compressed air help you punch out those extra profits with its versatility. And guarantee yourself a trouble-free source of supply by using Westinghouse Air Compressors. Sizes up to 40 hp — write for latest literature.

W-102

LE ROI *Division of Westinghouse Air Brake Co.*

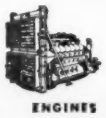
Milwaukee 1, Wisconsin

PORTABLE AIR COMPRESSORS

TRACTAIR

STATIONARY AIR COMPRESSORS

AIR TOOLS


ENGINES

For more information, use Reader Service Card, page 201

SIMPLICITY . . . balanced pan type conveyors can solve your materials handling problem

From prepared sand to hot castings, materials are better handled on Simplicity foundry equipment

This balanced pan type Model 32A Conveyor will fit where space is minimum, allow more headroom, and need little supporting structure.

These vibrating pan type conveyors give constant top efficiency in handling foundry sand and other difficult bulk materials. Through adding a second deck of perforated plate, they provide double service in shaking out and conveying small castings—discharging sand and castings at different stations. Equipped with replaceable liners of stainless steel, mild steel or aluminum, the 32 Series Conveyor readily conveys hot, abrasive, sticky or other difficult to handle materials. Readily adaptable for returning shot to shot blast cabinets. With baffles and staggered discharge openings, it discharges sand evenly over a silo. Available with four different assemblies, depending on volume and weight of materials to be handled. There is a Simplicity Conveyor in the exact size for your materials handling system—to give you uninterrupted operation and lower maintenance—a steady product flow—when you want it—where you want it.

SEND FOR BULLETIN 3255 TODAY!

• SHAKEOUTS & KNOCKOUTS • PORTABLE SAND CONDITIONERS • OS-A-VEYOR FEEDERS & CONVEYORS

158-A

SALES REPRESENTATIVES IN ALL PARTS OF THE U.S.A.

FOR CANADA: SIMPLICITY MATERIALS HANDLING LIMITED, GUELPH, ONTARIO

FOR EXPORT: BROWN AND SITES, 50 CHURCH ST., N. Y. 7, N. Y.

Simplicity
TRADE MARK REGISTERED

ENGINEERING COMPANY • DURAND 7, MICHIGAN

For more information, use Reader Service Card, page 201

Do Your Cores Score High

on each of these 19 VITAL POINTS ?

CORE & BINDER CHECK CHART

NOTE: Rate your cores on each point in column at left. Note in columns at right which Corn Products Binders provide highest degree of the qualities you need. For friendly help in developing a special formulation call on the man from Corn Products.

Check Here	Factor	1	2	3
———	Green bond	Mogul	—	—
———	Dry bond	Kordek	Dextrine	Mogul
———	Green sand	Mogul	Dextrine	—
———	Dry sand	Kordek	—	—
———	Flowability	Dextrine	Kordek	Mogul
———	Collapsibility	Dextrine	Kordek	Mogul
———	Scratch hardness	Dextrine	Kordek	—
———	Sound castings	Mogul	Kordek	Dextrine
———	Reduced baking	Mogul	Kordek	Dextrine
———	Better blowing	Mogul	—	—
———	Easy ramming	Mogul	—	—
———	Simplified mixing	Kordek	Dextrine	Mogul
———	Easy shake-out	Mogul	Kordek	Dextrine
———	Finer casting finish	Mogul	Kordek	Dextrine
———	Uniform mixing	Mogul	Kordek	Dextrine
———	Dry state, easily handled	Mogul	Kordek	Dextrine
———	Less handling, less waste	Mogul	Kordek	Dextrine
———	Corepaste	Kordek	—	—
———	Reduced costs	Mogul	Kordek	Dextrine

ARE YOU PACKING THE RIGHT SAND, right binders for a top-scoring formula? For friendly advice *ask the man from Corn Products.*

DO YOUR CORES SCORE HIGH on baked strength, surface hardness, collapsibility, shake-out? *Check with the man from Corn Products.*

The chart above shows *19 different points* in sand formulation and use where you can gain or lose casting quality and foundry time and dollars. Check each one against your own operation —and see where you can *not* honestly answer, "Perfect!"

Is your mixing and ramming quick, easy, certain? Cores high in green strength—fully sag-resistant? Do you score high on every point in baking, storage, casting? Check and double-check—see how you really rate. Then remember this:

MOGUL, KORDEK or DEXTRINE may give you top score on every point. High in green strength, baked strength and surface hardness respectively, they form the basis of any sound formula.

*Ask the man from Corn Products**—There's a just-right sand formulation that can save you untold time and trouble, assure superior quality castings, increased production. And *you* can develop it. Our technical department offers the friendly cooperation of experienced men on our foundry staff. They will work with you to solve any sand or related problem. They've helped solve hundreds of problems for others, can help solve yours.

***Corn Products Specialist in core room and foundry practice. Services available FREE!**

1906 • **50th ANNIVERSARY** • 1956
CORN PRODUCTS REFINING COMPANY
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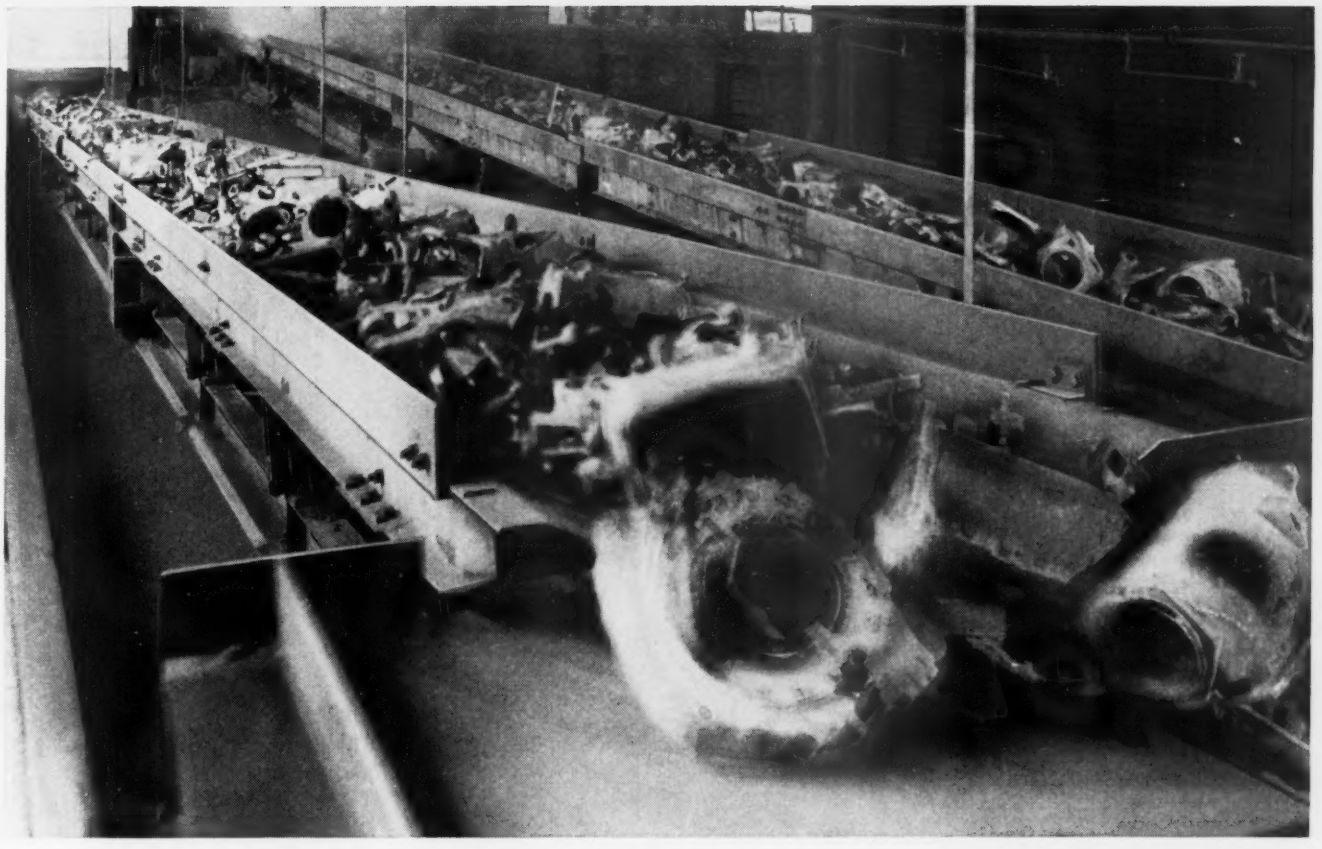
Makers of MOGUL® • KORDEK® • GLOBE® dextrine



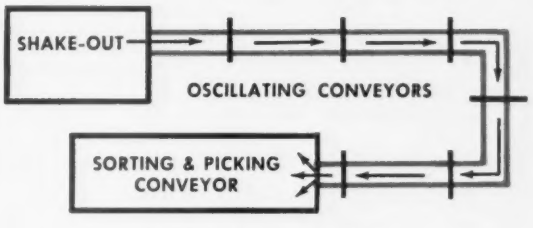
Large foundry mechanizes with 1650 ft. of LINK-BELT Oscillating Conveyors

Trouble-free system has capacity for cooling 400,000 tons of gray iron castings annually

PLANNING with this foundry's engineers, Link-Belt specialists found that the best cooling arrangement involved gentle movement of castings by oscillating conveyors up a 5-degree incline from shakeout to sorting. They designed a system of Link-Belt oscillating conveyors which permits continuous material flow . . . has brought safer, cleaner working conditions in the bargain. What's more, this gentle handling has eliminated damage to castings experienced in other types of conveyors in discharging from one unit to another.

Better cooling of castings on oscillating conveyors is but one phase of foundry engineering and equipment pioneered by Link-Belt. Our engineers can plan an entire conveying and sand preparation system for you . . . and follow through with a complete line of quality equipment to help you produce better castings at lower cost.

Whether you need one machine or complete engineering, call your nearest Link-Belt office. Be sure to inquire about stock availability of standardized sections of 36-in. oscillating conveyors, that cut both costs and delivery time. Also, get Book 2423 for complete information on Link-Belt's broad line of foundry equipment.



Layout of typical foundry oscillating conveyor application

AT LARGE MIDWEST FOUNDRY, gray iron castings cool on 48-in. Link-Belt oscillating conveyors specially designed for gentle handling and cooling of hot castings —operating at 12 to 15 ft. per minute. Positive action, constant-stroke eccentric moves materials in uniform flow regardless of surges. Other 36-in. wide oscillating conveyors are also important in this foundry's operations.

LINK-BELT

13,758

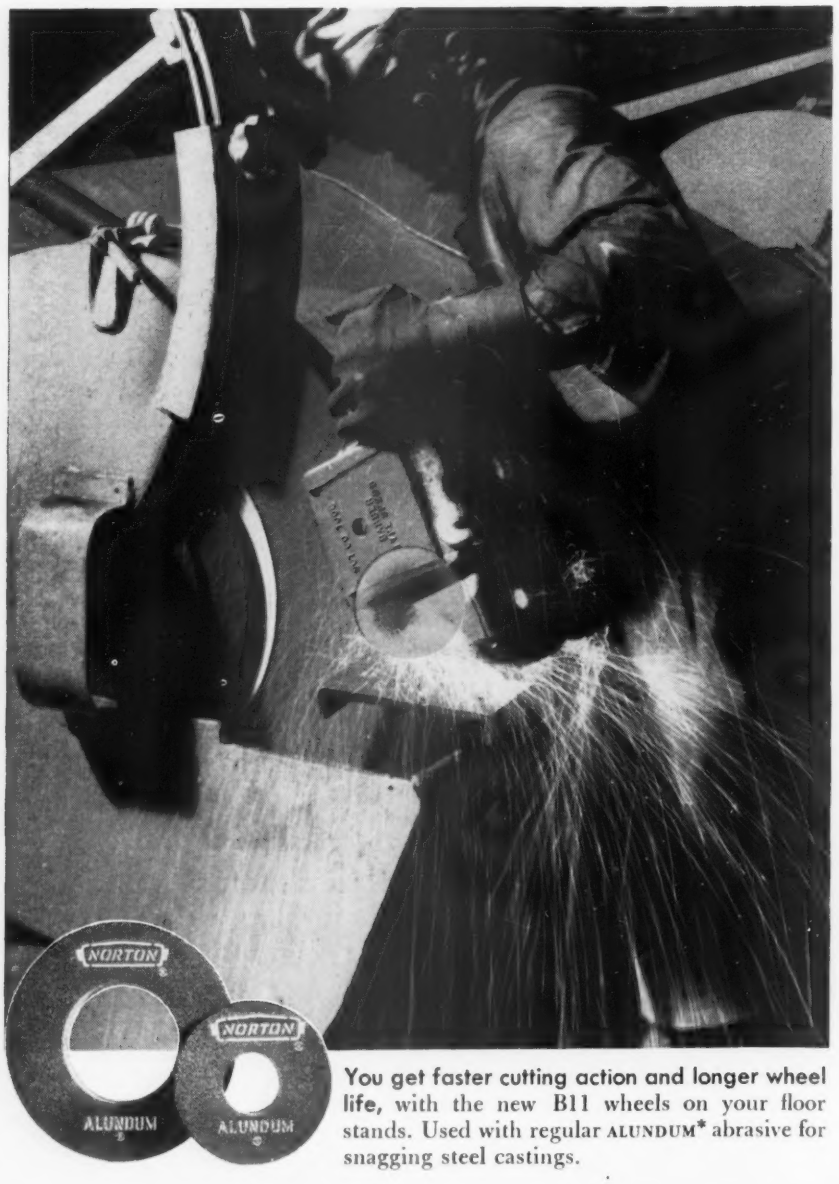
CONVEYORS AND PREPARATION MACHINERY

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

STEEL FOUNDRIES— *Here's Proof that*

B-11 Wheels grind off

Users tell how the new Norton resinoid bonded wheels add the "TOUCH of GOLD" *that cuts snagging costs*



You get faster cutting action and longer wheel life, with the new B11 wheels on your floor stands. Used with regular ALUNDUM* abrasive for snagging steel castings.

Reports on wheels made with the newest Norton resinoid bond — the B11 — are now coming in. Here are some typical comments from steel foundries around the country:

- *From New Jersey: "B11 wheels averaged 182 pounds of metal removed per wheel. Best previous was 125 pounds."*
- *From Illinois: "Cut best of any wheels ever used on this work. Very little dressing required."*
- *From Wisconsin: "B11 wheels cut faster, give more pieces between dressings, and more pieces per wheel."*
- *From Tacoma, Washington: "B11 wheels best ever used. Reordered 60 for floor stands and 80 for swing frames."*
- *From Massachusetts: "Hogs off large gates and risers with great rapidity. Best all-around wheel so far."*

The Norton B11 resinoid bond is an important contribution to progress in the widest range of snagging operations. Wheels made with it are more uniform in structure, with better balance. As a result, they grind cooler and faster. And on swing frame and portable machines they "hug that work" closer, with less vibration and bounce.

Another big advantage of B11 construction is that it gives you closest possible duplication. Hardness increments are evenly spaced through-

more steel per dollar

out the entire grade scale. And B11 wheels can be supplied in half-grade increments, making it even easier for you to choose exactly the right wheel for every job.

For snagging steel

the B11 bond and tough, sharp ALUNDUM abrasive make a powerful "Touch of Gold" team. In *your* cleaning room this combination means less operator fatigue, longer wheel life, time and money saved — advantages that add up to more profitable grinding for you.

See your Norton Distributor

for further facts on B11 resinoid bonded wheels, and about arranging test runs in your plant. Or write to NORTON COMPANY at the nearest office or at Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. Behr-Manning, Troy, N. Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

W-1690

NORTON
ABRASIVES

Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories

BEHR-MANNING PRODUCTS: Coated Abrasives Sharpening Stones • Pressure-Sensitive Tapes

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

You make deep cost cuts when you grind steel castings with B11 — ALUNDUM abrasive wheels. On swing frames the better balance and less vibration of B11 wheels reduces operator fatigue.

total time . . . six minutes

Why more and more foundries are using Airco torches for removing risers

The above sequence of photos is a typical case. It took the operator only 1½ minutes to cut each of the 9" diameter risers off this heavy casting using an Airco #9000 torch equipped with a size 10, style 164 Airco tip. Finished – the operator simply moved on to the next job. No castings had to be moved – thanks to the portability of the Airco torch. Grinding time reduced to a minimum.

Foundrymen are also discovering the versatility of Airco torches. Using *Genuine* Airco tips, many torch models can be quickly and easily converted for gouging, descaling, flame-hardening, scarfing and many other general foundry jobs.

It's easy to get complete information on all Airco torches and tips. Just contact your nearest Airco office or authorized Airco dealer. Ask for a free copy of catalog 818.

AT THE FRONTIERS OF welding PROGRESS YOU'LL FIND . . .

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AIR REDUCTION SALES COMPANY

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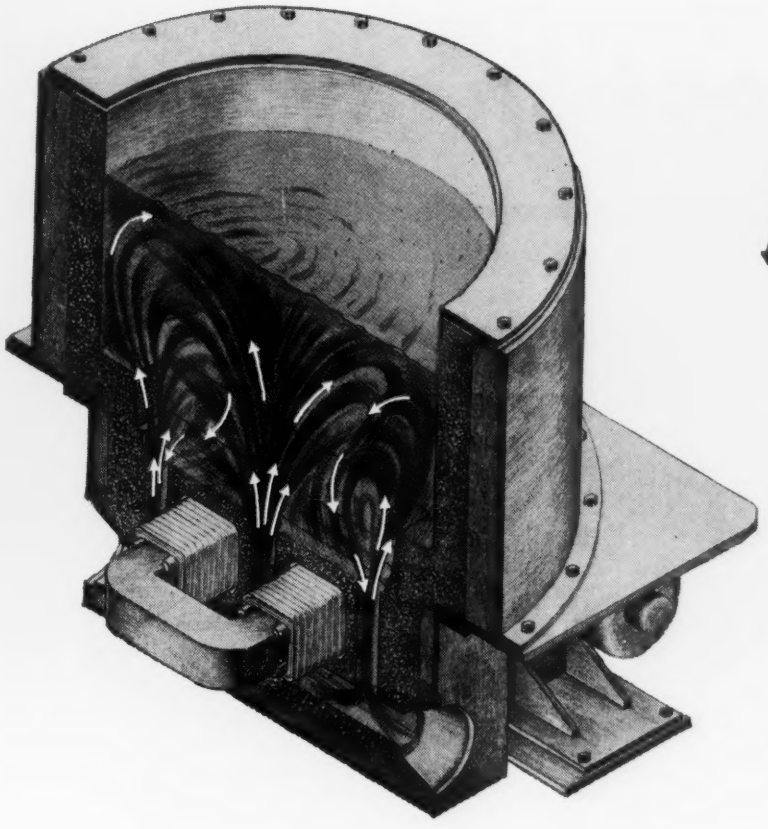
In Canada – Air Reduction Canada Limited

Products of the divisions of Air Reduction Company, Incorporated, include: **AIRCO** — industrial gases, welding and cutting equipment, and acetylenic chemicals • **PURECO** — carbon dioxide, liquid-solid ("DRY-ICE") • **OHIO** — medical gases and hospital equipment • **NATIONAL CARBIDE** — pipeline acetylene and calcium carbide • **COLTON** — polyvinyl acetates, alcohols, and other synthetic resins.

The Furnace That Stirs Itself!



ELECTROMAGNETIC PRESSURE CIRCULATES MOLTEN METAL

—In this 60 Cycle—

AJAX TAMA-WYATT *Induction Furnace*

Heat is generated only in the melting channels. Controlled stirring *(neither too much nor too little)* guarantees uniformity of metal temperature and alloy composition and also leads to efficient melting of light scrap. Tiresome puddling is eliminated. The metal is held entirely in an inert refractory lining. The atmosphere is cool and free from contaminating gases.

No Other Method Enables such Completely CONTROLLED MELTING

Today, AJAX builds a complete line of these time-tested furnaces in standard sizes up to 333 kW for the dependable melting of aluminum, brass, copper and zinc. Units for special applications are carefully engineered to specifications.

TWIN COIL INDUCTORS

Lead Non-Ferrous Melting

The sectional view above shows the twin coil stirring action of the 100 kW Ajax-Tama Wyatt 60 cycle induction furnace. Heat induced in the secondary channels below is conveyed throughout the melt by electromagnetic circulation as shown by the arrows. The 100 kW furnace shown here, is one of a family of twin coil furnaces available today for melting rates from 300 to 10,000 lbs. per hour.

For Further Information, Send For Bulletin R-43

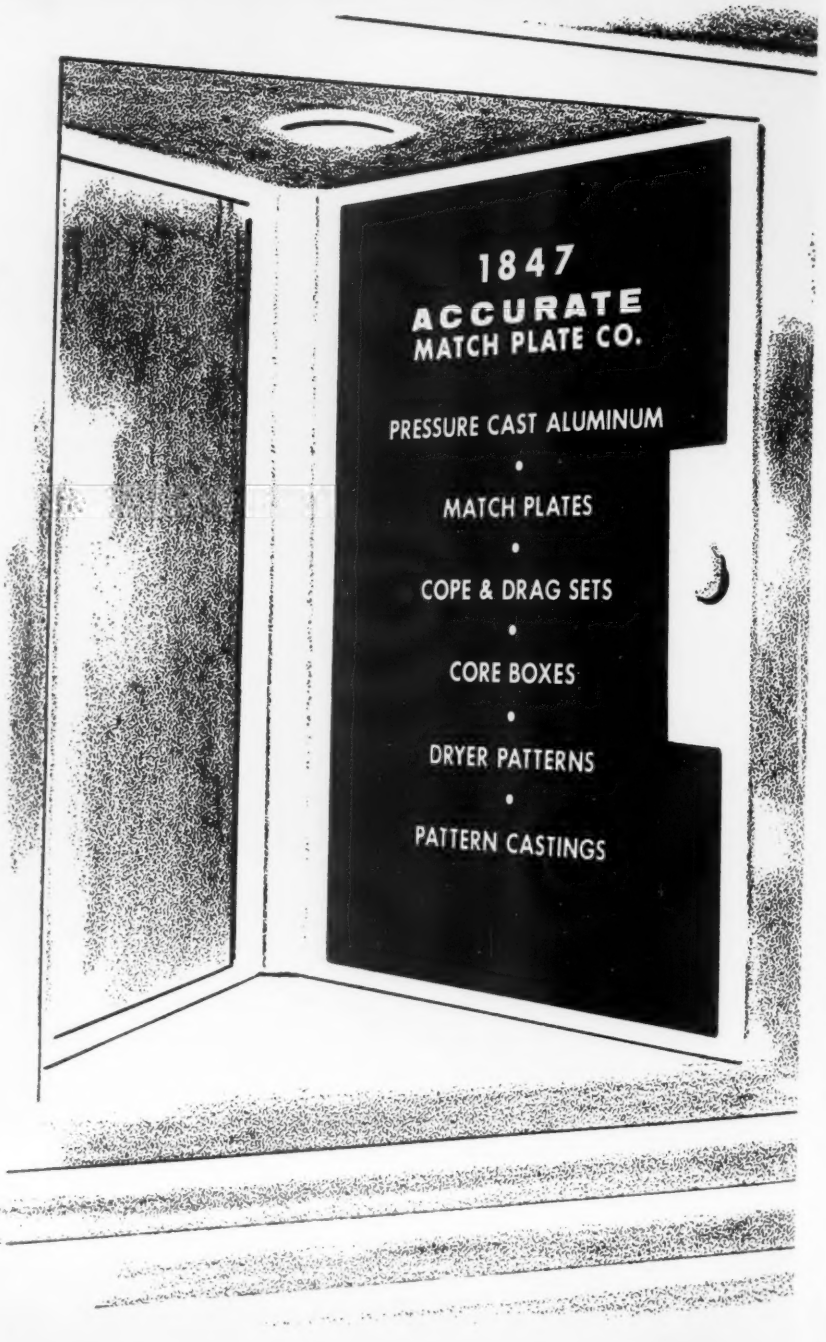
AJAX ENGINEERING CORP., TRENTON 7, N. J.

AJAX TAMA-WYATT INDUCTION MELTING FURNACE

AJAX ELECTRO METALLURGICAL CORP., and Associated Companies
AJAX ELECTROTHERMIC CORP., Ajax-Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., The Ajax-Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax-Wyatt Induction Furnaces for Melting

For more information, use Reader Service Card, page 201

Open the Door to Greater ACCURACY



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Telephone: Terrace 2-2683

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John M. Donohue
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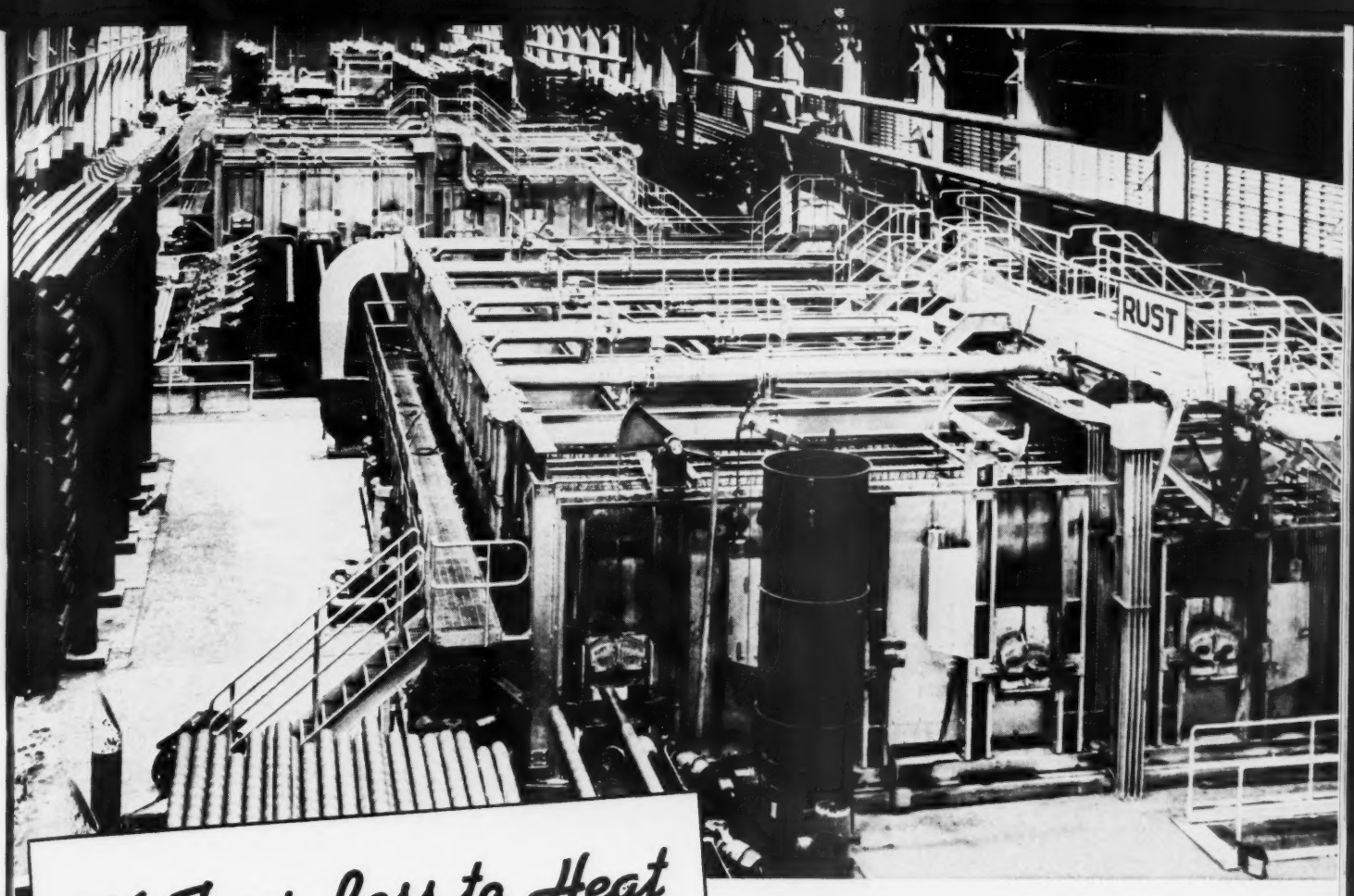


116 Tons Less to Heat in this roof

because of B&W Insulating Firebrick suspended construction

Here's another case where light weight means lower cost. The roof of this walking beam furnace is 2,320 square feet. B&W Insulating Firebrick suspended construction for a 9-inch roof weighs about 30 lbs per square foot, including the weight of rods, hangers, pipe, brick and mortar. This is approximately 100 lbs per square foot less than an arch constructed of heavy firebrick plus insulation having the same heat flow. *This saving means the B&W IFB roof is 116 tons lighter.*

The new walking beam furnace (shown in photograph above) was designed and constructed by Rust Furnace Company for Jones & Laughlin Steel Corporation. Seamless pipe is conveyed into the furnace, moves slowly from left to right on walking beam rails designed and furnished by York-Gillespie Mfg. Co., and passes out the exit door.

Here are the money-saving benefits of B&W suspended construction:

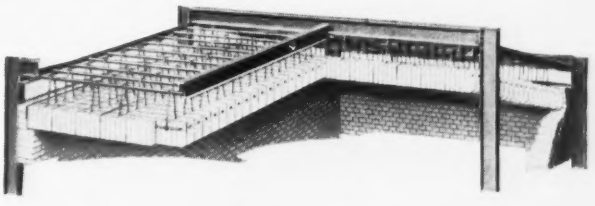
1. Supporting steel is less massive, far less costly. Commercial size steel can be used for roof suspension instead of special castings.

2. B&W Insulating Firebrick heat up and cool down faster. This means lower fuel costs, faster inspection.

3. Furnace temperatures can be changed quickly. When different steels call for different heating schedules, the furnace temperature can be adjusted in minutes instead of hours.

4. Installation costs are lower because these lightweight brick can be handled faster and easier than ordinary heavy firebrick.

For complete information on B&W IFB—the *lightest* weight insulating firebrick, write to B&W today or call your local Refractories Engineer.



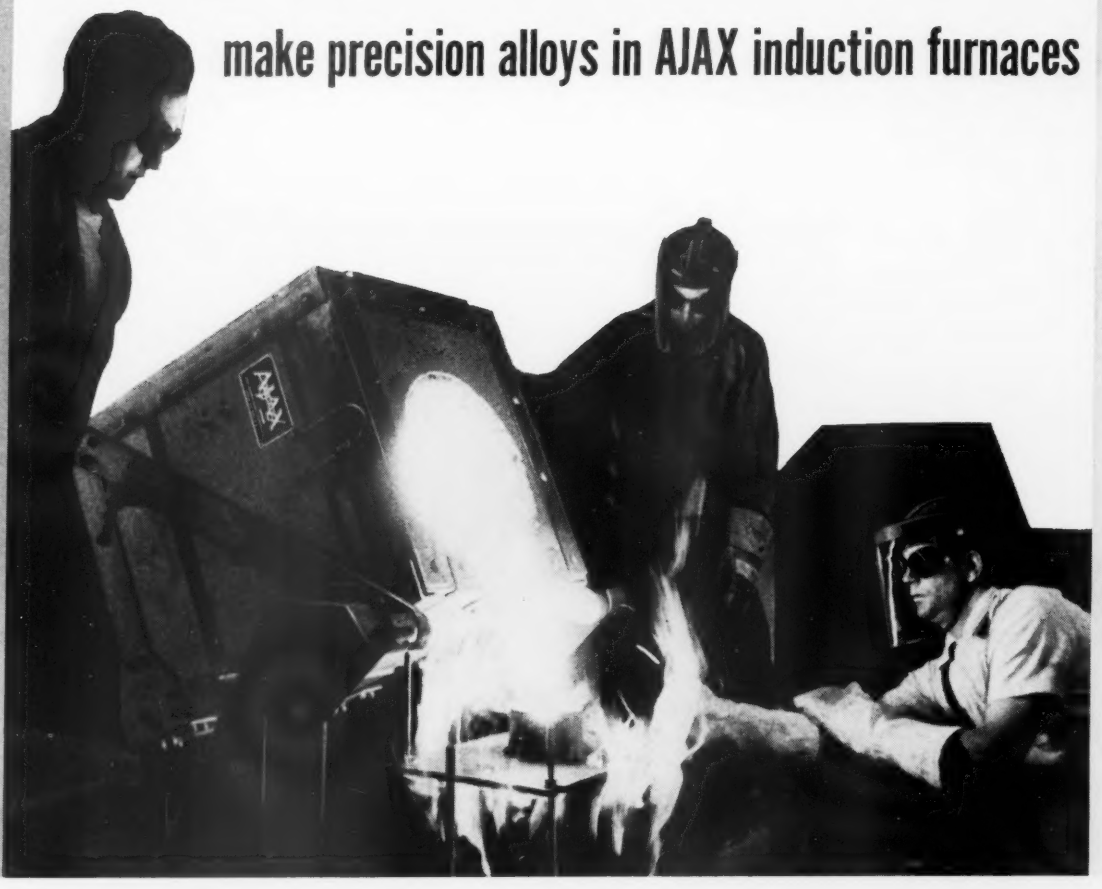
This is a cross-sectional drawing of a typical suspended arch arrangement using B&W Insulating Firebrick. It can be used in flat or sloping roofs, nose arches and many other types of suspended furnace construction.

BABCOCK & WILCOX

THE BABCOCK & WILCOX CO.
REFRACTORIES DIVISION
GENERAL OFFICES: 161 EAST 42nd ST., NEW YORK 17, N.Y.
WORKS: AUGUSTA, GA.

R 538

make precision alloys in AJAX induction furnaces

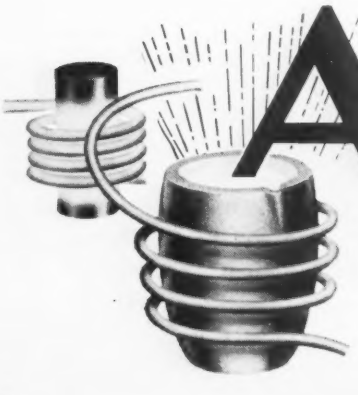


At the Edmore, Michigan, foundry of General Electric's Carboloy Department, all the critical Alnico series of alloys are made in AJAX-NORTHRUP induction furnaces. And you'll find the same choice of equipment wherever precision alloys enter the industrial picture. For the inherent advantages of AJAX induction melting are a perfect match for the uniformity, accuracy, and control required in precision alloying . . . whether ferrous or non-ferrous.

Electromagnetic fields in AJAX-NORTHRUP induction furnaces effectively "stir" the molten metal. Even those elements representing fractions of one per cent of the charge are uniformly distributed throughout the melt. And melting is so fast and clean that you're sure to get out of every melt exactly what you've put into it, subject, of course, to the normal slag problems inherent in the material being melted. There's no chance of contamination, and scrap is almost 100% recoverable. Temperature presents no problem, for both it and melting speed are easily controlled by varying power to the furnace.

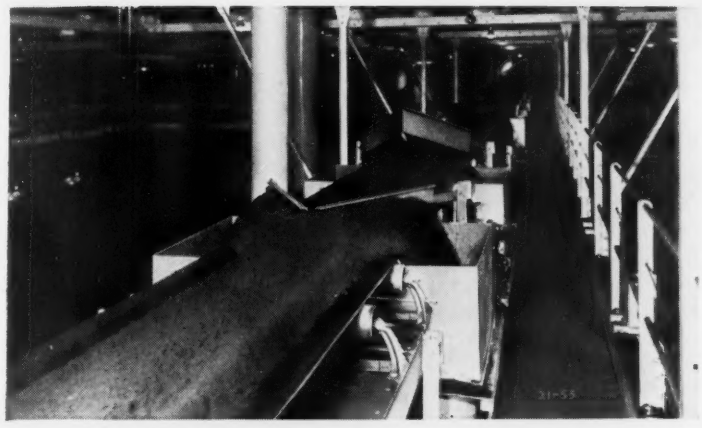
For forty years AJAX-NORTHRUP induction heating systems have saved money and improved product quality in every type of installation, ferrous or non-ferrous. Any wonder industry continues to choose AJAX equipment for precision alloying? For details, write Ajax Electrothermic Corporation, Trenton 5, New Jersey.

Associated Companies: Ajax Electric Company—Ajax Electric Furnace Co.—Ajax Engineering Corp.

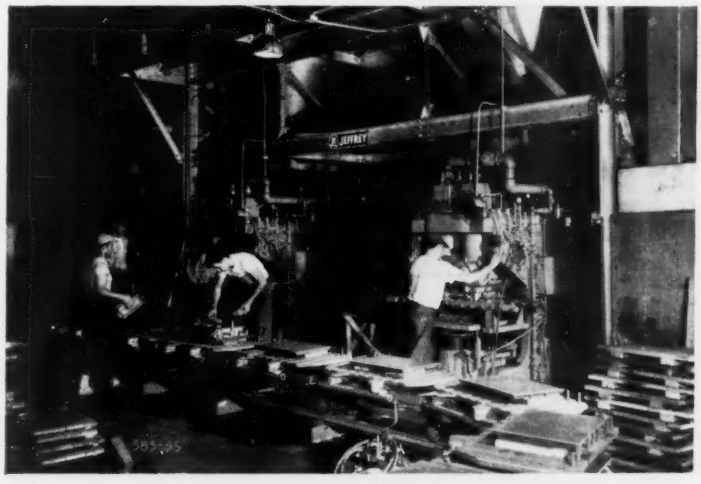


AJAX NORTHRUP SINCE 1916

INDUCTION HEATING-MELTING



Jeffrey Sand Handling Belt Conveyor with Automatic Plows



Jeffrey Universal Mold Conveyor

Jeffrey Universal Mold Conveyor, Automatic Mold Dumper and Apron Conveyor

Jeffrey Apron Conveyor Handling Castings

you'll see the difference in foundries planned by JEFFREY

MECHANIZATION takes over many operations formerly requiring manpower – from sand preparation and distribution to the molders and core makers, to the pouring positions and shakeouts, then back to sand reclaiming and storage—moving raw materials and processing finished castings. Jeffrey services to the foundry industry are that complete.

We'll start with a survey, prepare layouts and recommend equipment, build and install a system to suit your exact requirements. We'll alter existing facilities or replace obsolete units with modern, efficient Jeffrey machinery.

Catalog 845 describes these services and equipment. For a copy, write to The Jeffrey Manufacturing Company, Columbus 16, Ohio.

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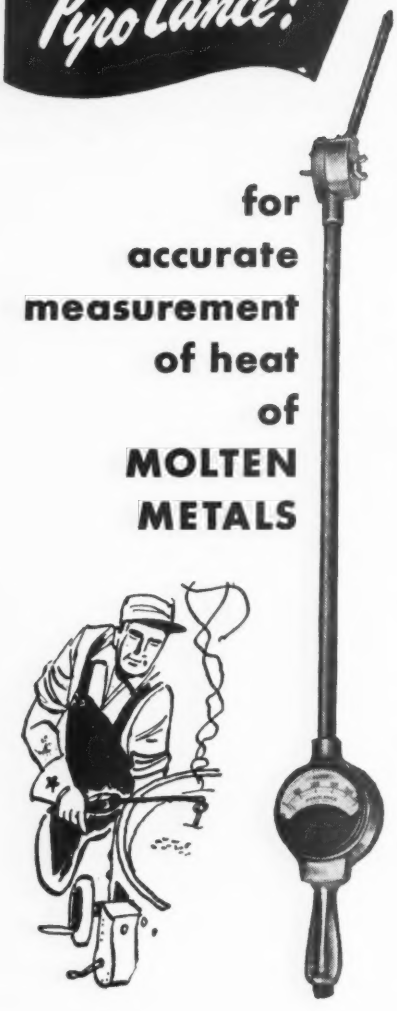
Pyro Lance!

for accurate measurement of heat of MOLTEN METALS



For quick, accurate temperature readings of molten metals, operators of non-ferrous foundries everywhere are relying on the Alnor Pyro Lance. Portable, handy to use, the Pyro Lance has a protected thermocouple, with adjustable angle head, mounted in the lance tip. It takes temperature below the surface—unaffected by dross or other conditions. Here's an easily handled instrument to help control quality in the foundry. For complete information and prices on this valuable instrument write for Bulletin No. 1724-D. Illinois Testing Laboratories, Inc., Room 511, 420 N. LaSalle St., Chicago 10, Illinois.

Alnor

PRECISION INSTRUMENTS FOR EVERY INDUSTRY

Readers' Comment

Should Push All Goods

TO THE EDITORS:

Just a note to acknowledge your fine editorial "Push the Fancy Goods." This is a very stimulating phrase and something we have been trying to do at Lebanon for some time. However, while "pushing the fancy goods," we must not overlook the "chili and beans" accounts which may not command the high price but usually provide the large production quantities.

If we can succeed in getting a moderately higher price for these production jobs and succeed in lowering our production costs even a little bit, the profits to be had in such an achievement are not to be sneezed at. However, I heartily subscribe to your philosophy of selling the high-priced goods as well. In other words, I'm for selling anything one can make a reasonable profit on, but it is all important to remember that you have to make the calls if you want to get the business.

WILLIAM H. WORRILOW JR.
Vice President
Lebanon Steel Foundry
Lebanon, Pa.

●

TO THE EDITORS:

I certainly enjoyed your editorial "Push the Fancy Goods" in the November issue of FOUNDRY. It is excellent.

M. J. ALLEN
Director
Personnel and Public Relations
American Steel Foundries
Prudential Building
Chicago

* * *

Solution Can Be Hazardous

TO THE EDITORS:

A solution prepared from chromium trioxide and acetic anhydride has been recommended for use in electrolytic polishing of metals, but in some instances without adequate warning of the hazard involved.

In our laboratories an accident recently occurred while such a solution was being prepared. The circumstances were as follows:

One hundred g of chromium trioxide were dissolved in 200 ml of water, the solution was cooled to room temperature (about 20° C), and 700 ml of acetic anhydride were added in a very slow stream (just faster than drop by drop) with constant stirring. During the course of this addition a slight rise in temperature occurred, the beaker containing the solution becoming warm to the touch of the technician.

Having completed the addition of the acetic anhydride, the operator left the beaker containing the solution on the bench and moved a short distance away. Within about a quarter of a minute the solution erupted from the beaker with sufficient violence to reach a ceiling some 16 feet above the beaker, and to fill the room with a fine spray. The operator suffered superficial acid burns on the face.

Since this mishap occurred, references to other accidents resulting from the mixing of chromium trioxide with acetic anhydride have come to our notice, but these references would probably not normally come to the notice of metallurgists or metal finishers who might be interested in using this type of electrolyte.

A. E. DAWKINS
Chief Superintendent
Defence Standards Laboratories
Department of Supply
Commonwealth of Australia
Ascot Vale W.2, Victoria

* * *

Foundries Must Be Awake

TO THE EDITORS:

I would like to take this opportunity to thank FOUNDRY for the wonderful article on "Automotive Gas Turbine" by Robert H. Herrmann which appeared in the January, 1956 issue.

We can certainly see from this article that the emphasis will be shifted from conventional casting and metal analysis to other methods and alloys to meet the coming requirements. Assuredly the foundry industry will have to be wide awake and on its toes to keep its business on the upgrade such as has been experienced in the last decade.

H. H. WILDER
Manager, Iron Foundry Division
Vanadium Corp. of America
2440 Book Tower
Detroit 26

* * *

Ceramic Crucible Advantages

TO THE EDITORS:

Several months ago in your Questions and Answers department, a discussion was presented on furnaces for melting small quantities of aluminum alloys. I would like to offer some additional information regarding the relative characteristics of ceramic crucibles and cast iron pots.

Your answer partially reads as follows: "While cast iron pots are said to have a better transfer of heat to the metal, careful attention

Here's a belt that is amazing foundry men

U. S. FoundryGiant Belt carrying shakeout sand.

It's U. S. Rubber's FOUNDRYGIANT Glass Fabric Belt

Consider its performance as reported by one of the largest and most modern foundries in California. One 18″ wide U. S. FoundryGiant belt carrying very hot reclaimed sand has lasted four times longer than any previous belt.

A second U. S. FoundryGiant glass fabric belt carries extremely hot shakeout sand back to the reclaiming system. A third U. S. FoundryGiant belt carries molding sand to the hoppers.

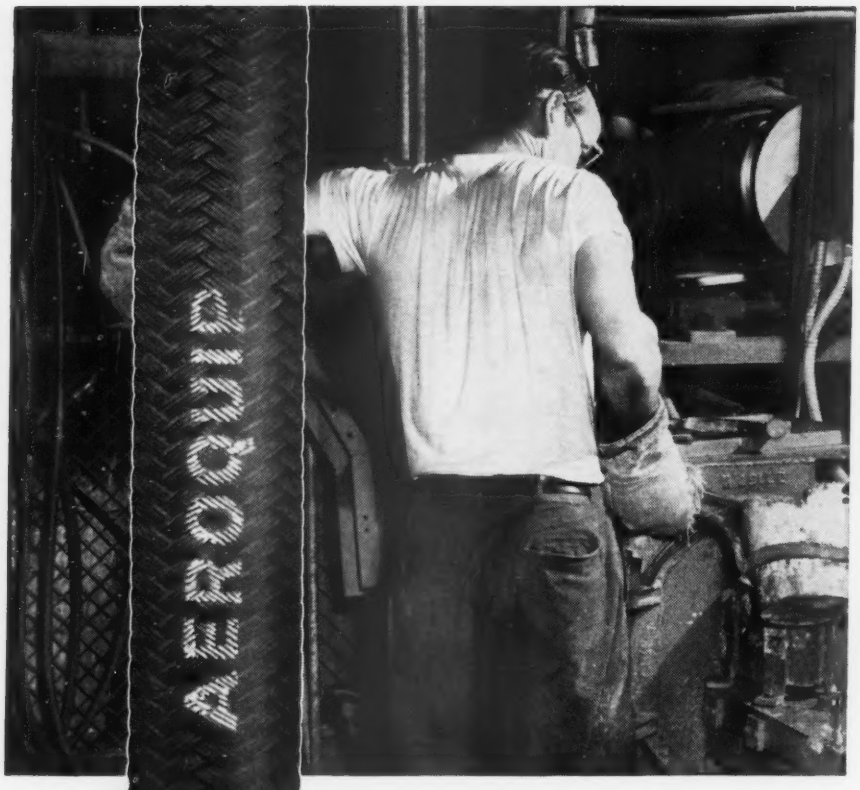
This foundry also uses other "U. S." quality products—pilot pipe and pinch valves to carry sand in a water slurry. The foundry management reports *high satisfaction* with the performance of all these "U. S." products.

The quality *and* durability built into everything made by "U. S." for the foundry industry lowers maintenance and overhead costs. "U. S." products are obtainable at any of our 27 strategically-located sales offices, or write to us at Rockefeller Center, New York 20, N. Y.

Large pinch valve used in a water slurry.

Mechanical Goods Division

United States Rubber



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must be given to coating the interior to minimize iron pickup."

Admittedly the cast iron has a higher specific thermal canductivity than the ceramic crucible. However, the cast iron pot is much more sensitive to heat and will not bear continuous temperatures much higher than 1500° F unless, of course, some special high-priced iron alloy is used. This maximum temperature leaves a relatively low differential between it and the melting temperature of the aluminum.

On the other hand, the ceramic crucible will readily withstand furnace temperatures up to 3000°, and consequently a much greater heat input can be utilized. The significance of the difference is brought out in AFS preprint 39-3 entitled "Efficiency in Crucible Melting" by G. K. Eggleston. This paper shows that by increasing the heat input and raising the furnace temperature, less fuel is consumed and the rate of melting more than doubled. The actual experimental figures supporting this conclusion are tabulated as follows:

Metal Temp, ° F	100 Units Input		61.3 Units Input	
	Units Used	Time, Min.	Units Used	Time, Min.
Melted	700	7.0	920	14.5
2050	750	7.5	950	15.0
2100	850	8.5	1010	16.0
2150	900	9.0	1135	18.0
2200	950	9.5	1300	21.0
2250	1050	10.5	1720	27.0

The above figures, established by laboratory test, have been and are amply verified in actual practice. When taking into consideration the other disadvantages of the cast iron pot such as the cleaning and scraping and coating described in your answer, the fact that the ceramic crucible aluminum may be melted with less fuel in half the time doesn't seem to leave much choice but to use a ceramic crucible. Perhaps the above facts are not widely enough known.

RICHARD H. STONE
Sales Manager
Vesuvius Crucible Co.
Pittsburgh 18

* * *

Brass Articles Valuable

TO THE EDITORS:

FOUNDRY is to be complimented for publishing such valuable information as contained in the articles by Harry St. John.

The current article on pouring practice is particularly interesting.

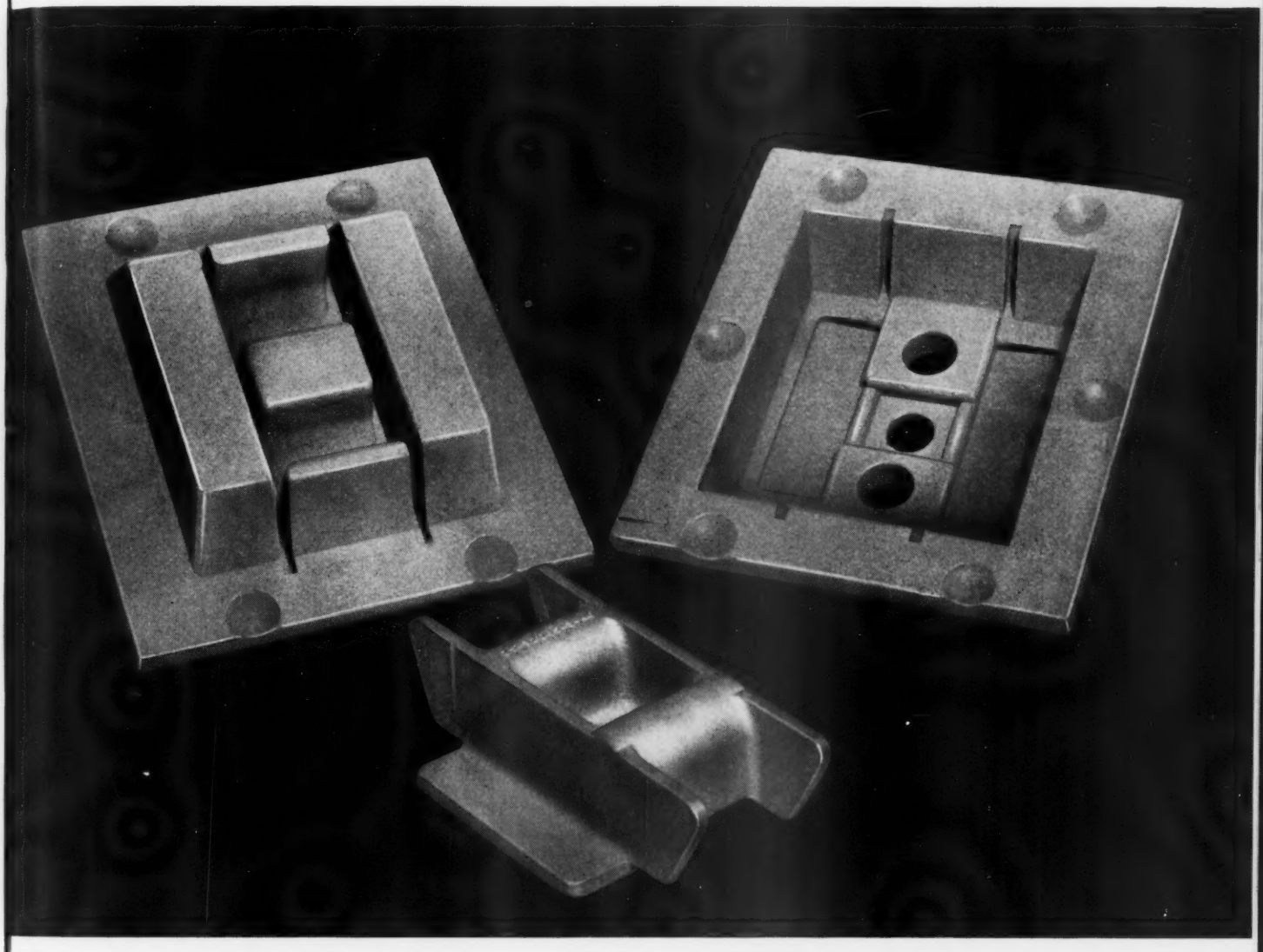
The trade is indeed fortunate to have such a valuable man who is so free with his knowledge and experience.

Nonferrous foundries should be able to make good use of his store of information.

D. H. LUCAS
6809 *N. Greenview Ave.*
Chicago 26

Monsanto announces newly developed

RESINOX* COLD COATING RESINS



Improved phenolic coating resins for shell molding reduce mixing time—eliminate caking problems of stored coated sands!

From the Foundry Research Laboratory at Monsanto comes a new Resinox formulation to improve the efficiency of your shell molding operations.

Resinox Cold Coating Resins have been extensively field-tested with dump box and blowing equipment—and have demonstrated outstanding free-flowing and non-segregation characteristics. With normal coating practice no caking is encountered in the coated sand.

The new Monsanto resins simplify coating formulation—just weigh out solvent and resin, then mix with sand. Using either the alcoholic deposition or liquid coating technique, the mixing cycle is appreciably shortened.

The shell molds made with these resins have excellent finish with superior hot strength and detail accuracy. Castings produced require little or no finishing. Edges are sharp and clean—intricate detail is no problem.

Because the economy and quality of shell molding depends so much on the resin used, you will want more specific information on this development. Send for data sheets and literature on the new Resinox Cold Coating Resins. Write Monsanto Chemical Company, Plastics Division, Room 448, Springfield 2, Massachusetts.

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Your reputation can rest on the performance of a single flask. So can ours. You can't afford a casting failure. Neither can we. For that reason *each* flask we produce, be it one or ten thousand, is the very *best* we can make. And each order we receive, whether for one flask or a carload, is handled as if it were the most important order in our shop. *It is.*

Next time you need foundry flasks we invite you to investigate the many advantages of STERLING. For complete information please contact our representative . . . or write

STERLING WHEELBARROW COMPANY • Milwaukee 14, Wis. U.S.A.

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Telling People About It?

Public relations for an industrial organization has been defined as "living right and telling people about it." While this sounds quite simple, unfavorable publicity frequently directed at the industry points to the pressing need for greater attention to this phase of successful foundry management.

Today foundries need not look to local areas for markets for castings. However, they are completely dependent upon the home community for an adequate supply of help and for numerous essential services. Mutual understanding between company and community is important.

To win the respect and secure the co-operation of the community, many factors, both inside and outside the plant need study and planned action. A few of the important considerations are as follows:

1. A clean and orderly foundry which will give the employee a feeling of pride in the company and plant.

2. Wash, shower and locker rooms which will permit workers to leave the plant looking like employees of any other business or industry.

3. A well kept building and clean and orderly yards so that the establishment is not an eyesore to the neighbors, the community or to strangers passing on the highway or railroad.

4. Collection of dust and dirt at the source so that it is not allowed to settle over the surrounding neighborhood.

5. Friendship with newspaper editors, radio and television station managers and the clergy of all denominations represented in the community.

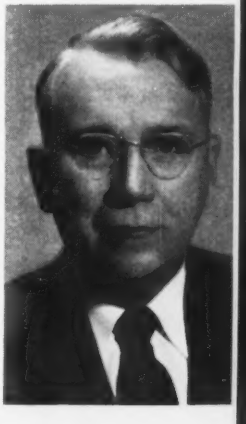
6. Open house visits for business men, service clubs, clergy, high school students, families and friends of employees and other citizens of the community. Talks before local schools.

7. Active company participation in and support of worth-while community activities.

How does your company stand in this matter of public relations? First of all, are you living right? And are you telling people about it?

At a time when the problem of securing satisfactory employees constantly grows more difficult, it would seem that public relations is a must for intelligent foundry management.

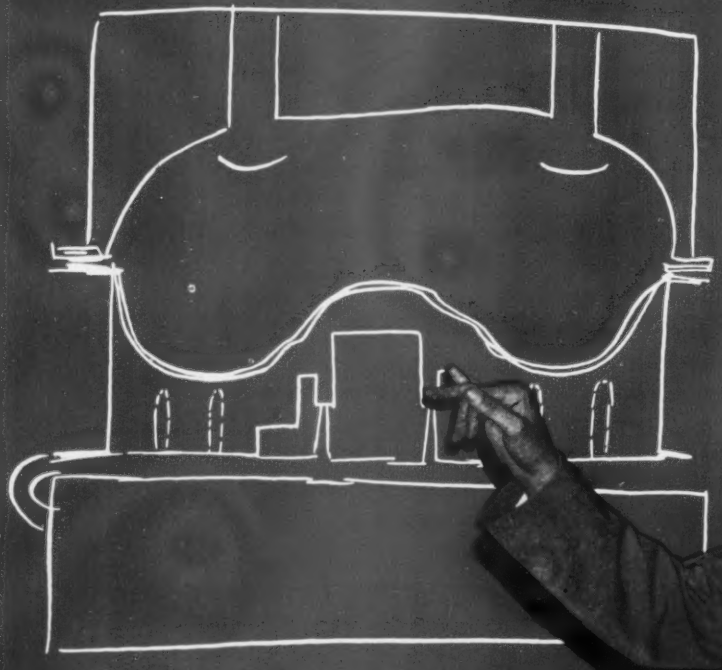
Frank G. Steinbach
Editor



HIGH-PRESSURE MOLDING

Past . . . . . Present . . . and Future

In his discussion of the development, present and future of high-pressure molding, the author concentrates on high-pressure molding sands now in use and on the possibility of hardening molds by CO_2 gassing



By THOMAS E. BARLOW
Sales Manager
Eastern Clay Products Dept.,
International Minerals & Chemical Corp.
Chicago

NEARLY three years ago, FOUNDRY presented an article, "Introducing High-Pressure Molding." Most of the possibilities described in 1953 have now been realized in commercial practice. The exact characteristics of the sands are better understood. The nature of the equipment seems to be rather well defined. The combination of proper equipment and adequate sand has been proven for the green sand phase and we seem to be ready to propose the next step in the proper use of high-pressure squeeze.

For maximum clarity, discussion of the subject is broken into three sections:

1. The past—which is necessary only for a clear understanding of the other two sections.

2. The present—which is principally a discussion of the sand used and how it differs from other synthetic sand.

3. The future—which presents the possibilities in cured molds made under high-pressure squeeze.

The Past—High-pressure molding started with 1) a briqueting machine, 2) some knowledge of waterless sands, 3) a smattering of information on ceramic molds and, 4) an idea. Many people were involved besides the author. Some of these men have stressed the limited application found in the original "ultra" high-pressure molding; the rest of us have followed the wider field of what people today know as merely high-pressure molding.

The basic conception was simple. Precision must come from a dense, firm mold. Such density is possible if sand of adequate flowability is squeezed under sufficient unit pressure.

The first effort was put on sand flowability. Since the first machine was a briqueting press operating at 600 psi, a waterless sand was developed to prevent water from being squeezed out of the mold during the molding cycle.

As the work took shape, some rather startling statements were made. For example, it was proved that mold density is not necessarily related to mold hardness. At any given mold hardness, density is a function of unit pressure and flowability. Another important conception (and the basis of today's practice) was the division of mold densities into three pressure classifications: 1) below 60 psi, 2) between 60 psi and 300 psi and, 3) over 300 psi.

It was found that mold density necessary for precision could be developed at 100 psi if flowability was sufficient and if some method of getting uniform squeeze was developed. The diaphragm principle provided the uniform squeeze, and a modification of the original waterless sand took care of flowability.

There were minor improvements to be found at pressures of over 300 psi. These slight improvements were available only at the expense of extremely rigid flask and pattern equipment and with more complex and difficult waterless sands.

In the transition from the original ideas to the present commercial utilization of those ideas, we find a certain amount of confusion. From time to time, we have presented written and verbal "progress reports" on this subject which have necessarily been incomplete. Consequently, there are many partial uses of the process where some part of the program has fitted with an existing operation. These partial applications are desirable but do not belong in a technical discussion of high-pressure molding. They represent improved foundry practice based on progress made in sands or equipment as a result of research and development of high-pressure molding.

For example, the research and development on flowable sand has led to the use of sand additives and practices which are of value to the foundrymen interested in better finish, reduced casting defects, improved dimensional control or uniformly harder molds. At the same time, the diaphragm equipment has appealed to many interested in better dimensional tolerance, reduced shrinkage, smoother finish or more versatile utilization of existing molding sands. In many cases, the final practice will involve combining the sand and equipment; in other cases, the application is served sufficiently by the partial step already made.

The Present—We now have a situation in which pressure-molding sand is used with low-pressure equipment and pressure-molding equipment is used with ordinary sands. Each has found uses aside from the original concept. Now that production facilities are improving for both equipment and sand additives, there are a growing number of true pressure molding applications in which equipment and materials are mated to give the ultimate in green sand precision, finish, soundness and saleability. Foundries which have had only half the package are developing the other half. Those which have had the complete package are extending its use.

Complete discussion of the technical aspects of high-pressure molding as it exists today would involve both equipment and sand. However, a complete description of equipment was presented before the AFS Pattern Division in Houston, Texas in May, 1955. This is available in the 1955 *Transactions* of AFS. It can be considered sufficiently up-to-date to eliminate the need for full coverage again at this time. However, there is no recent summary of the high-pressure molding sands. The information previously available was not sufficient to present the reasons for the steps taken. We feel that such a summary is needed at this time.

Something New in Moisture Control—It is difficult to decide which feature of the sand practice is the most unusual or the most important. However, since this sand practice grew from the use of waterless sands, we may logically start with the relationship between water and additive or treatment. Actually, the sand practice as used today is so closely related to the original practice that it introduces an entirely new conception of mois-

ture control in sand. It is now possible to operate a sand of any fineness at any desired moisture level! The choice of moisture is entirely up to the user. It is based on the requirements of the casting, not upon the inherent character of the base sand.

Fig. 1 illustrates the unusual properties of these "high-pressure" sands. The illustration requires some study because it is unlike any sand chart published previously. It is the key to the peculiar effects possible with this practice, whether molded under high pressures or as used commercially in all regular methods of molding.

A family of curves is shown to illustrate the effect of base sand. Each curve represents a different fineness and distribution curve in typical foundry sands. In this case, curve A represents a relatively coarse sand of 50 to 60 AGF while curve E is typical of a sand of 120 AGF or finer. It is normal to expect the finer sand to require the greater percentage of moisture or additive, or both.

The curves shown are taken from observations of a rather elusive property—workability or moldability. In this case, we can define moldability as that property of sand which permits the production of a green sand mold capable of furnishing a sound casting. The curves might be interpreted to indicate the "feel" of the sand.

Let us take curve D as an example. This curve shows that with no additive, the clay-sand mixture is at temper at 4 per cent water. With the proper amount of clay (western bentonite, in this case) the sand "felt" workable and produced good castings. So far, everything is normal. Now if we look at the zero-per-cent moisture-line, we find that the same sand-clay mixture with 3 per cent additive was also workable, but this time with no moisture. This was the waterless sand of the early work on high-pressure molding. There were practical problems involved such as sensitivity to mulling temperature, excessive smoke, high chemical loss, etc., which made the practice uneconomical. This type of sand is no longer used but remains the basis for present practice.

Now look at curve D in the vicinity from 1.8 per cent water to 3.6 per cent water. This is the range of present practice. The foundryman decides ahead of time which moisture he desires and then controls it with a change in the percentage of additive. In any case, the sand is equally workable and moldable. In fact, it is impossible to tell from the "feel" whether the sand is being operated at low moistures or high moistures. In practice, it is not necessary to know. If the sand "feels" wet enough, it is wet enough even if the moisture happens to be below 2 per cent. The laboratory can determine the exact moisture but the man at the muller needs only know if the sand is "too wet" or "too dry." He can control easily (and as accurately as is possible with the "feel" test usually used at the muller) without knowing the exact moisture level involved.

The man in charge of sand does want to know the moisture because the moisture level controls much of his casting quality. To use an example, suppose he desires to produce fine finish, close dimensional control and easy cleaning on small intricate castings. Moisture is the enemy of all these so he will add enough chemical to force the moisture to below 3 per cent or even below 2 per cent if the casting demands the maximum quality. In light work, he will be using a fine sand to obtain maximum finish and so will use from 1.25 per cent to 2.25 per cent additive. If this is a special facing, that's the end of it. If it is a system or batch of sand used over and over, he will add approximately 0.08 to 0.15 per cent each time the sand is reused. The exact amount will depend upon 1) the metal-to-sand ratio, 2) the heat of the casting when shaken out and 3) the metal section or surface area.

Requirements in Large Castings—Another reason for a high-additive, low-moisture sand would be seen in large castings (from ¼ ton to 3 or 4 tons) in which the chief criterion is reasonable finish, combined with good dimensional control and overshadowed by a requirement for freedom from scabs, buckles and similar "sand" defects. Again moisture is the worst enemy, so the water

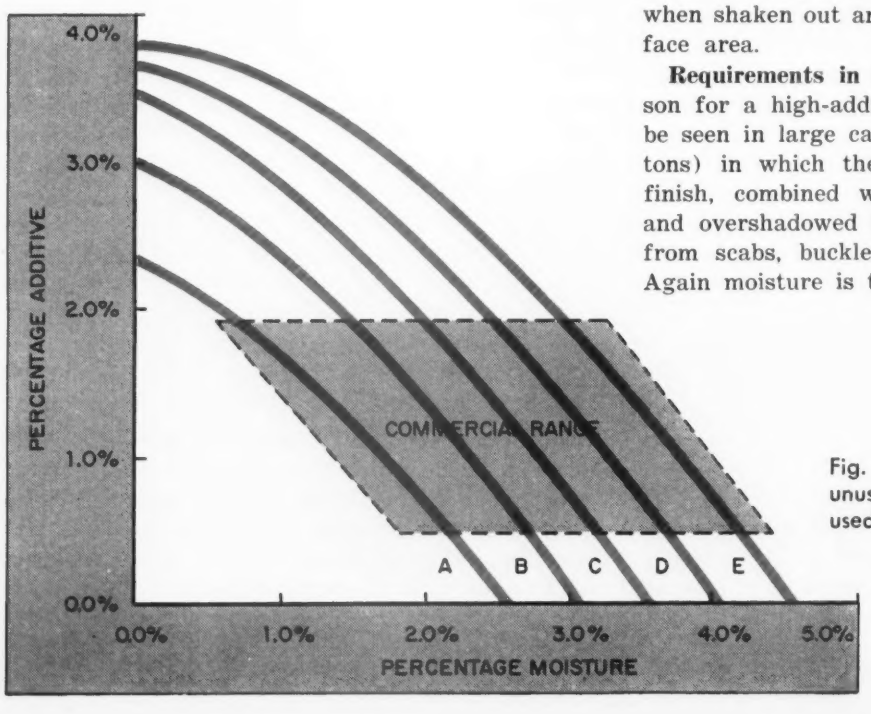


Fig. 1 — Chart illustrates the unusual properties of sands used in high pressure molding

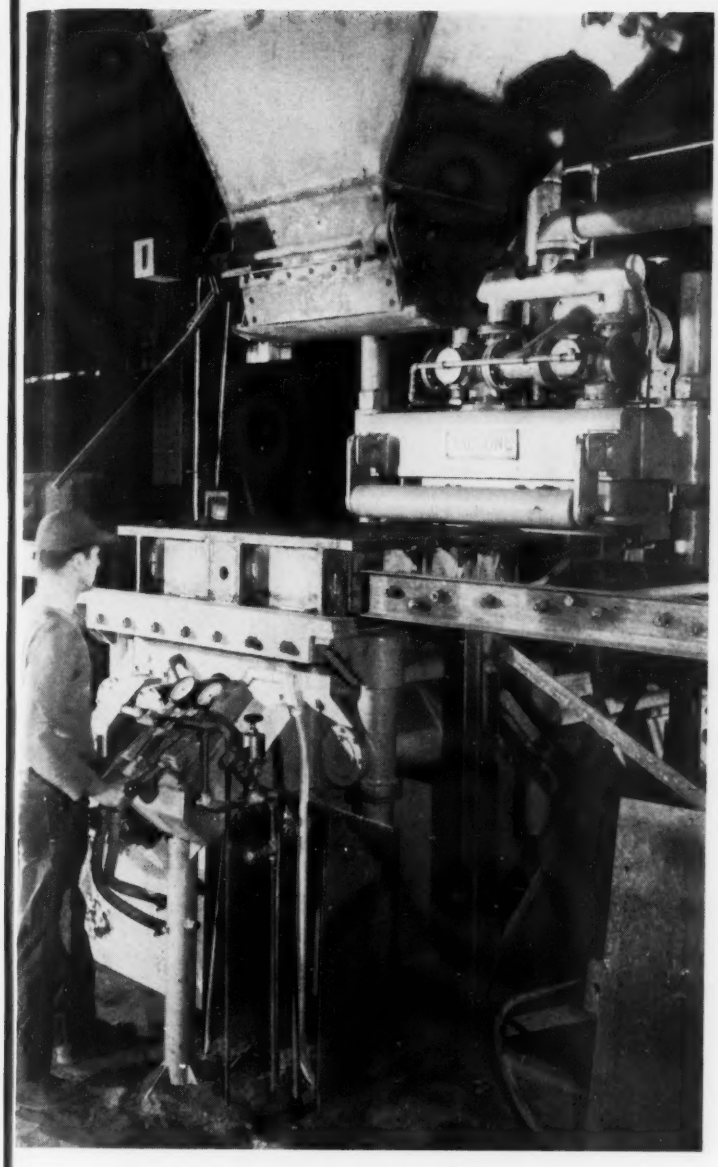


Fig. 2—Working with a high-pressure molding unit at Burnham Boiler Corp., Lancaster, Pa.

would be forced to a minimum. In a sand suitable for such work—approximately 60 to 70 AGF—a chemical addition of 1.50 to 2.25 per cent would hold moistures well below 2 per cent and still maintain workability. Again the replacement addition would average around 0.10 per cent unless the metal-sand ratio was unusually high or the casting involved an unusual amount of surface area for its weight.

In many castings (possibly most) the requirements are not so stringent. Reasonable precautions are needed against scabs and buckles. Good finish is desirable for sales purposes. The most important criterion may be casting weight. The foundryman realizes the value of producing castings to reasonable weight-control. For example, in yellow brass castings, even a small mold may vary in weight by 6 pounds. At 44 cents per pound, sand control becomes important. In gray iron, the reduction in weight of 2 pounds on a 25-pound casting saves from $100 to $300 per each thousand pieces produced by the foundry.

Again, moisture is the enemy because of its effect on flowability. But in this case, controlling the moisture to 3.0 per cent or even 3.5 per cent is usually sufficient. Therefore in castings up to 100 pounds, a sand of 80 AGF with 1.0 per cent or possibly 0.75 per cent additive will provide the finish and flowability desired. Coarser sands for heavier castings or rougher finish will require even less. Again reuse will average around 0.10 per cent for average conditions but may be as low as 0.05 per cent with low metal-to-sand ratios.

To summarize, moisture is predetermined by the requirements of the casting. To clarify this picture, it is necessary to remember that the control over moisture is immediate and predictable. It is entirely practical to have the majority of the sand operating at a moisture of 3.2 per cent (for example) and yet at any time a special batch can be made as a facing or for a special floor with moisture held to 2 per cent by proper additive control. Such special sands may incorporate some fine sand for fine finish on special work or coarse sand for added permeability on heavy work. The special sand can then return to the system or heap with no danger of contamination or loss of control, because the same ingredients are used. Only the amounts are changed.

With such a sand, we can combine fine sand and low moisture for the first time.

An "Impossible" Combination—The second characteristic necessary in high-pressure molding (and useful in any green sand molding) is the "impossible" combination of strength, toughness and flowability. The chemicals added must permit high strength or preferably augment the strength. This is true because strength and hardness are necessarily related. When we remember that mold hardness (in green sand) is merely a measure of surface strength, we see the importance of high strength when high hardness is desirable. For that reason, high-pressure sands are operated in excess of 10 pounds, and usually in the range of 14 to 18 pounds green strength.

With hardness, we must have density if we are to have a precision casting. To have density, we must have flowability. To obtain flowability in the face of high strength has been a major problem. Fortunately, the worst offender against flowability is moisture. So the additives produce flowability at least in proportion to their ability to decrease moisture. In addition, since such additives are nearly 100 per cent liquid carbon, they produce a lubricating effect for added flowability under conditions of high-pressure squeeze.

To illustrate this point, we can use a pattern with deep pockets or with a minimum of distance between pattern and flask. Under such conditions, high-pressure sand is found to be as densely rammed with 14 to 16 psi green strength as an ordinary synthetic sand is with only 8 to 9 psi green strength. At the same time, the higher strength, combined with normal deformation, provides higher toughness to permit picking up such

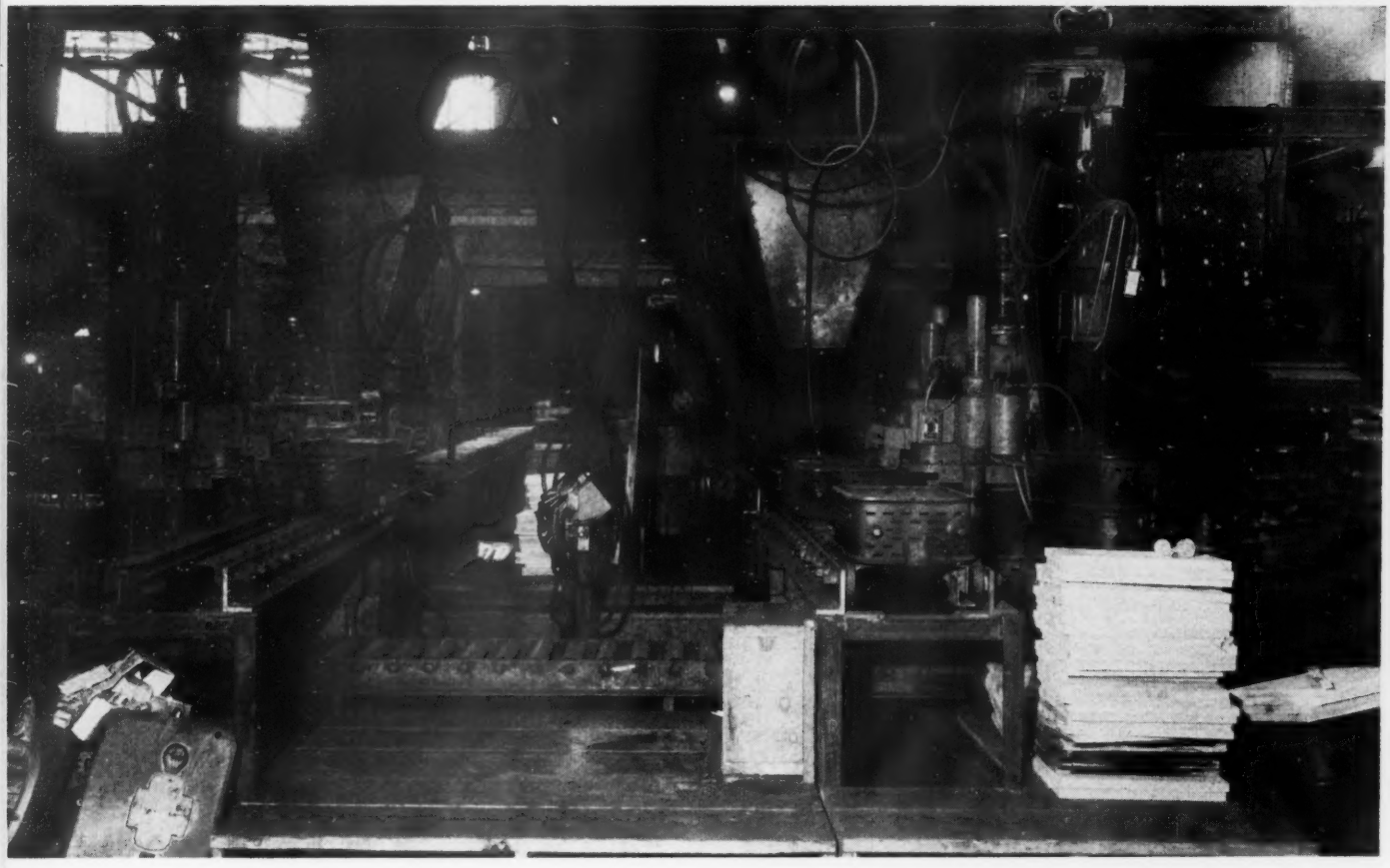


Fig. 3—View shows setup used with two high-pressure molding machines in use at Riverside Foundry, Bettendorf, Iowa. Fig. 4 is a close-up of unit at right

pockets with a minimum of "drop-outs."

Before leaving the subject of high-pressure sand, we should mention the relationship between fines and cellulose material. In these sands, the additives are highly concentrated forms of carbon. Being so concentrated, they need some form of bulk material to properly fill the sand voids and provide a means for proper distribution of expansion stresses in the mold. We usually assume the use of a definite proportion of cellulose but hasten to add that proper sand distribution may replace the cellulose (and usually at a lower cost).

In the complete absence (practically speaking) of fines, as much as 3 per cent cellulose may be needed for 1 per cent additive. Most sands, however, have sufficient fines to reduce this to 2 per cent for 1 per cent or 1 per cent for 1 per cent. In four or five screen sands, especially when fine, the fines frequently are sufficient to reduce the requirement for cellulose to zero. The presence of larger amounts of clay and/or silica flour have a similar effect. These must be used with caution, however, to avoid excessive green strength from clay or excessive hot strength from silica flour.

As peculiar and unscientific as it may sound, the requirement for cellulose is readily judged by "feel." A heavy, gummy sand becomes light and fluffy when cellulose is added. A brittle sand becomes tough as the additive is increased or the cellulose reduced.

To summarize the requirements for high-pressure sand, we must have relatively high strength to obtain maximum hardness. In addition, we need the following very unusual sand properties:

1. High toughness combined with high flowability.
2. Low moisture, even in very fine sands.
3. Ability to hard ram without expansion defects.
4. Ability to modify properties, quickly and precisely.

The Future—It is obvious that these same properties find commercial application in molding practices other than high-pressure squeeze. In fact, the same additive has been applied to the sodium silicate—CO_2 process because of the desire for low moisture (usually less than 1 per cent in this case) combined with improved green strength, ease of shakeout and ability to provide a reducing atmosphere for elimination of burn-in or rough finish. In this case, the effects find application in all cast metals, whereas the green sand practice has found application in all metals except cast steel.

The introduction of high-pressure chemicals to CO_2 sands has disclosed the activity, now in the development stage, aimed toward extending high-

Fig. 4—Close-up of molding setup at right in Fig. 3, at Riverside Foundry, Bettendorf, Iowa

pressure molding to cured molds or shells. This work is based upon the assumption that certain castings should be made in cured molds to prevent "washing" or erosion of unsupported surfaces or to provide the necessary strength for intricate "fingers" or protrusions in the mold to an extent not possible in any green sand practice.

To explain this development, it is necessary to revert to a brief description of high-pressure molding equipment. The obvious objective of such equipment is to develop sufficient squeeze pressure to develop mold density without the necessity for jolting or ramming. As mentioned earlier, this pressure has been found to be most suitable in the range between 60 psi and 300 psi, depending upon the contour of the pattern. The vast majority of pressure molding applications are made at 100 psi using the diaphragm principle. The diaphragm has the flexibility needed to follow the contour of the pattern in such a way as to provide uniform density on all pattern surfaces. In this way, the need for higher pressures on complicated shapes is avoided and flask and pattern requirements are simplified as compared to 300-psi squeeze machines.

The nature of a diaphragm squeeze is such that the sand is molded into a green sand shell. In other words, the diaphragm follows roughly the shape of the pattern being molded and, therefore, appears as an outline of the pattern cavity. In green sand molding this "shell" of sand is sufficiently thick to support the casting load with no further treatment. In some cases (to permit weight-setting for example) the uneven contour is struck off flush to duplicate the appearance of a normal mold.

Molding with CO_2-Cured Sands—The same equipment should lend itself to the CO_2-cured sands because the characteristics of such sands include freedom to flow under squeeze pressures and controlled properties when treated with high-pressure chemicals. In this case, however, the green (silicate-sand) shell is kept reasonably thin by the use of shallow flasks. The flask depth determines the shell thickness. Since this work is still in development, precise statements as to the desired thickness for various casting weights cannot be made. We do feel, however, that these shells should be of sufficient strength to avoid the need for any back-up material or treatment.

The procedure is basically simple. The special sand is placed in the flask and run under the diaphragm squeeze head. After squeezing, the completed green shell is treated with CO_2 *before* being stripped from the pattern on the usual pin-lift, bar-lift or roller-rail lift mechanism. In the development stage, the CO_2 gas may be introduced from the sand side by the usual techniques. In commercial practice (when that day comes), we assume that the CO_2 will be introduced from the pattern side through pattern "breathers" or vented permanent probes on the pattern plate.

The relative thinness of the shell formed by the diaphragm permits rapid curing while the high density of the high-pressure squeeze imparts maximum cured strength. It should be remembered that the CO_2 core or mold depends upon a film of silica for its strength. Grain to grain contact or high density is needed to make such a film-bond effective with a minimum percentage of binder and a maximum ease of shake-out.

To summarize, high-pressure molding started with the conception that green sand molds were capable of producing "precision" castings if sand of proper fineness could be made flowable and if high-pressure squeeze were exerted to develop high mold-density. At the present time, the sand practice combining low moisture, high strength, high toughness and high flowability even in fine sand is being used for "precision," "semi-precision" and "weight-controlled" castings under conditions of both high and low-pressure squeeze. At the same time, high-pressure equipment is being used with ordinary high-strength sands to impart maximum finish and weight-control for the sand involved. Complete high-pressure molding, combining sand and machine, is producing castings of unusual dimensional tolerance, finish and precision.

Development work is well along on the combination of high-pressure diaphragm molding with treated silicate-CO_2 sands for the production of cured molds at high speeds.

Composition and Application of

BRASS

NUMEROUS attempts have been made to classify nonferrous alloys according to composition, properties or use. The most generally accepted classification by composition is that of the American Society for Testing Materials (ASTM), a summary of which may be found in the American Foundrymen's Society's "Copper - Base Alloys Foundry Practices," 1952 edition, page 1.

While such a tabulation is useful in establishing terminology, so that we all mean the same thing by the alloy names we use, it does little to help the foundryman select the best alloy for any particular application. It is our purpose here to classify and describe nonferrous alloys by groups and within these groups to show the relationship between composition and economic usefulness to the foundryman.

The great number and extreme diversification of brass-foundry alloys make helpful classifications difficult. The brass foundry industry as a whole deals with copper, zinc, tin, lead, nickel, aluminum, silicon and manganese in an almost infinite number of combinations ranging from substantially pure copper to substantially pure nickel. Small quantities of other elements—such as phosphorus, sulphur, iron, antimony, chromium and arsenic—are commonly present either as impurities or as intentionally included additions. With the exception of pure copper and pure nickel castings, both relatively rare, virtually every casting produced in the brass foundry is made from an alloy.

At this point let us make our apologies to the physical metallurgist. For the sake of convenience and simplicity, certain terms will be employed here as they are used in every-day foundry parlance, not always in accordance with strict scientific usage. For example, many foundry alloys would be described by the physicist as mixtures containing two or more alloys mixed with each other and sometimes with elemental metals. In brass foundry alloys, we are commonly dealing with solid solutions of one metal in another. A physical metallurgist might define a solid solution as: "A metallic phase consisting of a typical lattice of mixed atoms of two or more elements in random orientation within the lattice." (Harrington, *Modern Metallurgy of Alloys,* 1948, page 31). To be less abstruse, if somewhat more wordy, let us say that a solid solution is an apparently homo-

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FOUNDRY ALLOYS

The eighth article in Mr. St. John's series on The Brass Foundry begins a discussion of compositions and applications of brass alloys. He covers the high-strength, yellow and semi-red brasses in this article

geneous solid substance consisting of two or more elements in varying proportions, ranging from zero of one element to its limit of solubility in the other. The constituent elements cannot be distinguished from one another even under the microscope, just as we cannot find the salt in a solution of salt in water. The properties of a solid solution are variable, depending upon the quantity of each constituent present, just as a salt solution may be more or less salty.

Three Considerations—As foundrymen our interest in the alloys we use is centered in just three things: What kind of castings will they make? How will they behave in the foundry? What do they cost? In attempting to show the relationship between these interests and alloy composition, it will be helpful to group our alloys in two ways, both as to composition and as to the properties which govern their practical application. In general terms the applications of nonferrous castings may be grouped as follows:

1. Structural, where strength and sometimes appearance and resistance to corrosion are of prime importance.
2. Transmission of gases and liquids, where pressure tightness and sometimes appearance and resistance to corrosion come first.
3. Bearings, where toughness and varying degrees of hardness are most desired.
4. Ornamental work, where appearance comes first and resistance to corrosion is often important.
5. Bells, where tonal quality is the goal and resistance to corrosion often is necessary.
6. Miscellaneous applications, including high electrical conductivity, nonmagnetic properties and non-sparking properties.

It will be noted that appearance and resistance to corrosion are mentioned in several of the above listings. It is this combination of properties which most often governs the selection of nonferrous alloys in preference to less costly metals. Often ease of machining is also a factor.

In what follows, the alloys under discussion will be grouped by composition.

1. Copper-base alloys in which zinc or tin is the dominant alloying element. This group includes the most commonly used brass foundry alloys. In most cases both zinc and tin are present, often mixed with lead. The presence of small amounts of nickel is not unusual. At the high-zinc end of the series, iron, manganese and aluminum are intentionally included.
2. Copper-base alloys in which silicon is the dominant alloying element.
3. Copper-base alloys in which aluminum is the dominant alloying element.
4. Copper-base alloys in which nickel is the dominant alloying element.
5. Pure copper and copper containing not more than 2 per cent of other elements.
6. Nickel-base alloys. Combinations in which nickel plays the principal part in determining the properties of the casting.

Dealing first with what we may call the foundry brasses and bronzes, since this is the most widely used group, an attempt will be made to produce some semblance of order by starting with those alloys which are highest in zinc and lowest in tin, then proceeding with diminishing zinc and increasing tin, finally reaching the true bronzes, in which zinc is either a minor factor or entirely absent. The literature lists hundreds of alloys in this series and many are in common use. It will be found, however, that a virtually complete series of useful properties can be obtained by listing a comparatively small number, each typical of a class within the group.

High-Strength Brasses—These are traditionally known as manganese bronzes although manganese plays a minor role in determining their properties. We are concerned here with two very different solid solutions of zinc in copper. As the proportion of zinc increases up to about 40 per cent we have the alpha solution which gradually becomes harder, stronger and more yellow as more zinc is added. Iron, aluminum and manganese, which may be present in appreciable quantities, add to the effect of the zinc in proportion to what

are called their zinc equivalents. When the amount of zinc and its equivalents exceeds 40 per cent we suddenly leave the alpha phase and have instead the beta solid solution, a material of quite different properties. For example, the alpha solution is malleable when cold but is "hot short"—that is, it crumbles when exposed to stress at or near a red heat. The beta solution, on the other hand, is malleable and ductile when hot, which makes it suitable for hot forging.

The two alloys shown in Table I are typical of the manganese bronze class. The analyses given are middle-of-the-road compositions. Official specifications allow a rather wide variation in copper, zinc, manganese, aluminum and iron—the five elements which mainly determine the properties of the alloys. However, it is possible to get into trouble within the specification limits if zinc and its equivalents are too high in proportion to the copper. The physical properties shown are minimums, capable of considerable improvement under favorable conditions. All sorts of variations are possible between these two extremes. The lead in Alloy 1 serves a useful purpose by improving machinability at the expense of tensile strength and elongation. By reducing the lead, elongations of 25 per cent or more are obtainable in manganese bronzes of moderate strength. The highest tensile strengths require the practical elimination of lead.

TABLE I—Manganese Bronze Alloys

Alloy	1	2
Copper, per cent	59.00	62.00
Zinc, per cent	36.00	26.00
Manganese, per cent	1.00	3.50
Aluminum, per cent	1.00	5.00
Iron, per cent	1.00	3.00
Lead, per cent	1.00	0.20 max.
Tin, maximum per cent	1.50	0.20
Tensile strength, minimum, psi	60,000	110,000
Yield strength, minimum, psi	20,000	60,000
Elongation, minimum per cent	15	12
ASTM Alloy No.	B147 (7A)	B147 (8C)

The addition of aluminum increases the strength of manganese bronze, but care should be taken to decrease the zinc correspondingly. Iron refines the grain and improves both strength and elongation. Manganese raises the yield strength. Tin improves corrosion characteristics but also causes brittleness and is particularly to be avoided in the higher strength alloys. In these alloys silicon also is injurious. Other elements than those mentioned present as impurities are usually limited to 0.25 per cent.

Because of their high zinc content, the manganese bronzes benefit by a uniform application of heat during melting, best attainable by a thorough mixing action in the furnace. They should be poured as hot as the volatile nature of the alloy will permit. They are not sensitive to gas porosity, and deoxidation before pouring is not required. Because of the aluminum present, turbulence during pouring must be avoided and the use of a pouring basin is advisable. Solidification shrinkage is high and for this reason ample gates, runners and risers are necessary.

The manganese bronzes have physical properties similar to those of a mild steel plus good resistance to certain types of corrosion. They are particularly useful for exposure to sea water but are not recommended for use at temperatures exceeding 350°F. Their resistance to some types of fresh waters is not good and the increasing use of chemical treatment in industrial and potable waters has limited their application in a field where they were once widely employed. Among the applications for which their peculiar properties make them suitable are marine propellers and fittings, worm wheels, heavy-duty bearings, lever arms and architectural ornamentation.

Yellow Brasses—The matrix of the manganese bronzes is composed of the beta solution or a mixture of beta with alpha. If we leave out the significant alloying elements, iron, aluminum and manganese, and keep the zinc below 40 per cent, we have just plain yellow brass, an alpha solid solution of zinc in copper. Usually tin, lead and sometimes a little aluminum are added. The two alloys given in Table II are typical.

Specifications permit some variation from the analyses, and moderate variation has little influence on the physical properties. Iron, within the limits named, is supposed to refine the grain. Aluminum is not permitted in Alloy 3 if this is to be used for pressure castings, but often it is intentionally added in Alloy 4 to improve fluidity and appearance. Contrary to some published statement, phosphorus (1 oz of 10 per cent phosphor-copper per 100 lb) improves fluidity and machinability in Alloy 3, *provided no aluminum is present,* but should never be used in Alloy 4. ASTM specifications permit a maximum of 0.015 per cent.

TABLE II—Yellow Brass Alloys

Alloy	3	4
Copper, per cent	72.00	61.00
Tin, per cent	1.00	1.00
Lead, per cent	3.00	1.00
Zinc, per cent	24.00	36.85
Iron, maximum per cent	0.60	0.75
Aluminum, maximum per cent	none	0.50
Tensile strength, minimum psi	35,000	40,000
Yield strength, minimum psi	12,000	14,000
Elongation, minimum per cent	25	15
ASTM Alloy No.	B146 (6A)	B146 (6C)

Alloy 4 is suitable for structural purposes only, where its strength and pleasing appearance are of advantage. Small machine parts formerly cast from this alloy are now usually made from die castings, stampings, forgings or powder-metal sinterings.

Alloy 3 is used for inexpensive pressure castings, where the pressure is low, as in plumbing goods, for example. It is also suitable for structural parts and is much more machinable than Alloy 4.

Much of the gain from the low cost of yellow

brass alloys is lost due to their foundry behavior. As compared with the semi-red and red brasses, they are sluggish and require relatively large gates and runners. This results in a low casting yield and is accompanied by above-average scrap losses. The high percentage of zinc is responsible for large melting losses in some types of melting equipment and also complicates the problem of heating and ventilating the foundry in keeping with modern standards.

Semi-Red Brasses—Of this useful group of alloys the three in Table III are selected as representative. As usual the minimum figures for

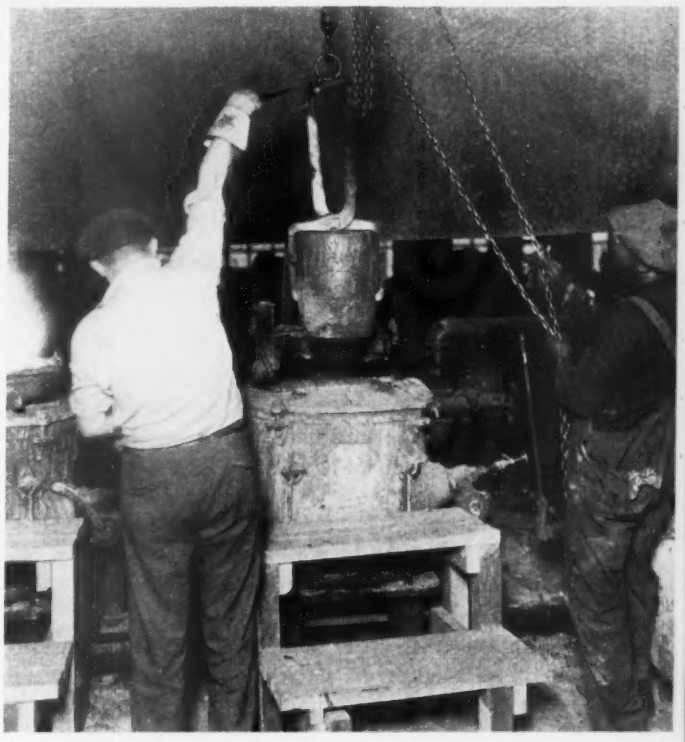
TABLE III—Semi-Red Brass Alloys

Alloy	5	6	7
Copper, per cent	76.00	77.00	81.00
Tin, per cent	3.00	3.00	3.00
Lead, per cent	6.00	10.00	7.00
Zinc, per cent	15.00	10.00	9.00
Tensile strength, minimum psi.	25,000	25,000	29,000
Yield strength, minimum psi.	12,000	12,000	13,000
Elongation, minimum per cent.	15	10	18
ASTM Alloy No.	B145 (5B)		B145 (5A)

physical properties are far short of the best obtainable results. Of the four principal elements, with the exception of tin, considerable variation in percentage is possible without any marked change in physical properties. Tin is critical and should not be allowed to fall below 2.5 per cent as an extreme minimum. In the semi-red and red alloys tin joins zinc in the copper alpha solution while lead, practically insoluble, is distributed more or less uniformly throughout the solid solution matrix. The high lead in Alloy 6 offers somewhat of a problem because of its tendency to sweat to the outer surface of the casting. Partly for this reason and partly because of modern caution with respect to lead poisoning, Alloy 6 has lost much of its traditional popularity to Alloy 7. The cheapness of Alloy 5 recommends it, and in skilled hands it yields good results.

In these alloys both aluminum and silicon are subversive or poisonous impurities. Scarcely a trace can be tolerated since a minute quantity of either will affect both the surface appearance and the structure of the casting. Iron, manganese and antimony are comparatively harmless up to 0.25 per cent each but in combined total should be less than 0.50 per cent. Phosphor-copper is a useful deoxidant but residual phosphorus in the casting should not exceed 0.04 per cent, possibly 0.05 in Alloy 7. Sulphur should be as low as possible. It certainly should not exceed 0.08 per cent.

As we reach the point where copper constitutes about 80 per cent of the alloy, nickel begins to play a unique role. In the alloy discussed previously, the freezing range is short and the metal solidifies in a dense fine-grained structure. But in the semi-red and red brasses the freezing range is long and the rate of crystal formation slow. There is a tendency for the brass to crystallize in coarse



dendrites with open spaces between crystals. Although nickel is soluble in all proportions in the alpha solution and cannot be found as a separate entity under the microscope, it exercises a profound influence on the crystallization of the alloy. As little as 0.5 per cent noticeably refines the grain while 2.0 per cent produces a dense structure throughout relatively heavy sections. Five per cent nickel will even offset the injurious effect of small percentages of silicon or aluminum. It seems unfortunate that so many specifications limit nickel to 1.0 per cent.

Aside from their long freezing range, the semi-red brasses behave well in the foundry. The solidification shrinkage is less than that of the yellow metals. Gates and runners need not be so large and the casting yield is correspondingly improved. Only large castings require risers. Scrap can be reduced to a low point provided the correct pouring temperatures are determined carefully and strictly observed. In this respect these alloys are extremely critical. (See FOUNDRY, December, 1955, p. 90.) The constant use of a good pyrometer is essential.

The semi-red brasses are suitable for use in plumbing fixtures, low-pressure valves, fittings and structural parts where great strength is not required. Their resistance to many forms of corrosion is good.

Alloys of this group in which the zinc is less than 9.0 per cent are classified as red brasses. These blend almost imperceptibly with the tin bronzes which they closely resemble. Red brasses and bronzes will be the subject of the next article.

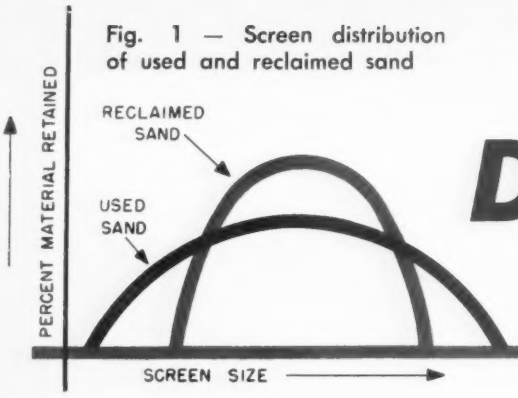


Fig. 1 — Screen distribution of used and reclaimed sand

Dry Reclamation

WASTE sand trucked to dump areas long has been a concern and an expense to foundrymen. Sand expenses are especially high for foundries at a considerable distance from sand pit areas. Cost of new sand handling at the plant, of storage space and of additional charges for disposal of used sand make it attractive for any foundryman to find a simple and effective system of sand recovery.

The operating volume of foundry sand, although partly diluted by the addition of fresh new sand in the form of facing and cores, becomes gradually inferior because of accumulated burned clay, carbonaceous materials, silica flour, etc. Such a sand requires more binding materials to overcome the effects of the contaminants and consequently more water or oil to produce the desired physical characteristics.

Sand reconditioning methods include crushing, magnetic separation, screening and air classification. Such operations treat sand as a mass. The compound grains are not broken, and the tenacious coatings of dehydrated clay or burned carbon are not removed from the individual grains. Intensive scrubbing for an extended period of time is required for effective removal or smooth-up of these coatings. At the same time, a moving medium has to be provided to exhaust undesirable fines. A true reclamation system performs work upon individual sand grains and re-establishes original screen distribution.

The two main objectives of dry sand reclamation are to loosen and peel off the coatings through the impact and attrition imparted by high-velocity air, and to eliminate coating debris by entraining it in slow-moving air and trapping it in a dust collector.

The physical characteristics of constantly reused sand change, and its screen distribution curve becomes flatter than that of new or reclaimed sand (Fig. 1). Compound grains are retained on larger sieves, and particles from coatings increase the amount of fines on high-number sieves. An excess of compound grains contributes to mold face instability, resulting in erosion and metal penetration, especially close to gates. The high percentage of fines decreases permeability and increases the total sand surface area to be wetted and bonded. All these factors create the possibility of casting defects.

Dry sand reclamation tends to reduce the angular projections of individual grains. This rounding of grain contours contributes to better sand flowability. The scrubbed surface seems to have better adhesive quality, and less bonding material is necessary.

Reclaimed sand grains are clean except for residual material located in the crevices; it is this material which imparts to the sand a dark gray color. Under a microscope, however, the true surface condition is revealed. A microphotograph (Fig. 2) shows, for comparison purposes, a sand before and after reclamation. Heavy coatings on used sand grains and some of the clusters can be noted, in contrast to the clean, individual grains of reclaimed sand.

Principle of Operation—The pneumatic sand scrubber is equipped with a turbo-blower directly connected with the motor. Depending on the rated capacity of the unit, 30, 60, or 100-hp motors are used for two, four or eight-cell scrubbers. The 3 to 4-psi air is delivered to a receiving chamber for uniform distribution to individual scrubbing cells. In operation, each cell receives up to 500 cfm of air. Air velocity inside each blast tube varies from 6000 to 8000 fpm.

Sand to be reclaimed should be low enough in moisture to flow freely without packing. Before being fed into the scrubber, the sand passes through a four-mesh screen. Sand lumps thus are eliminated and need not be broken up in scrubbing cells, permitting more work to be done on individual grains during scrubbing.

Fig. 3 shows a schematic section of a single cell consisting of air nozzle, blast tube, target, outside pipe and part of the scrubber housing. The sand descending by gravity in the annular space between the blast tube and outside pipe is forced into the space between the nozzle and blast tube entry piece. It is entrained in the air stream, passes upward through the blast tube and is blown against the cone-shaped target.

The force of the air-sand mixture emerging from the blast tube holds a layer of sand in the apex of the target and protects the target from abrasion. The result is that sand grains impinge on sand grains and gradually abrade their bond coatings. Air escapes through the descending sand curtain falling from the periphery of the target, carrying with it pulverized bond particles. These fines suspended in the escaping air are exhausted from the scrubber and into a dust collector.

# of Foundry Sand

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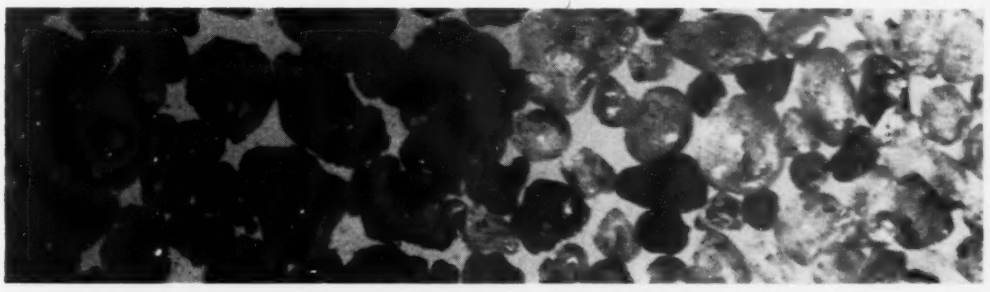


Fig. 2—Photomicrograph of a sand before (left) and after (right) reclamation

The quality of the reclaimed sand is controlled by regulating 1) the sand feed rate into the scrubber, 2) the velocity of air delivered by turbo-blower, 3) the amount of air drawn by the fan of the dust collector and 4) the setting of the distance between the air nozzles and entry pieces of blast tubes.

1. With faster feed, the sand grains pass through fewer cycles in each cell and emerge from the scrubber less clean than if fed at a slower rate. A longer retention period, and consequently more scrubbing cycles, result in cleaner sand at the discharge.

2. Air velocity in the blast tube has a direct effect on the impact of sand grains against each other under the target. By control of the damper at the outlet of the turbo-blower, the velocity of the air can be adjusted according to the type of sand processed.

3. The exhaust intensity has a direct bearing upon the amount of fines removed. The separation of these fines can be held in line by regulation of the intake damper of the dust collector fan.

4. Speed of sand flow inside each cell, and consequently the amount of scrubbing performed per time element, is influenced by the spacing between the outlet of the air nozzle and the entry piece of the blast tube. There is an optimum setting for each type of sand. If the spacing is too short, a comparatively small amount of sand will enter the air stream and will attain excessive velocity. This condition in turn promotes faster wear of blast tubes and a tendency toward breakage of sand grains. On the other hand, if the distance between nozzle and blast tube is too great, the air emerging from the nozzle partly escapes upward along the exterior of the blast tube. This condition restricts the flow of sand inside the cell and interferes with proper scrubbing action.

A continuous horizontal flow of sand through a

Fig. 3 (right)—Schematic section of single cell reclamation unit

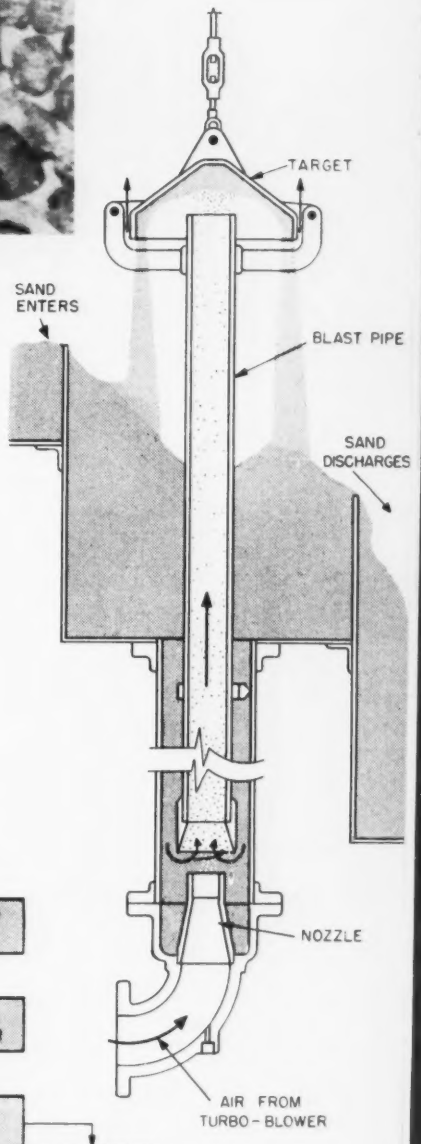
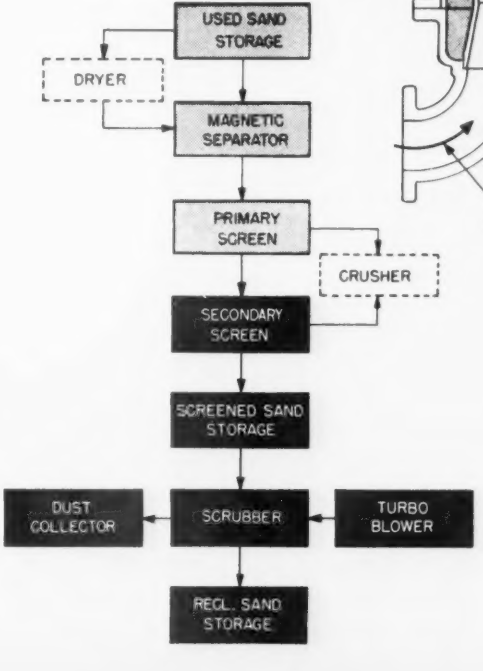
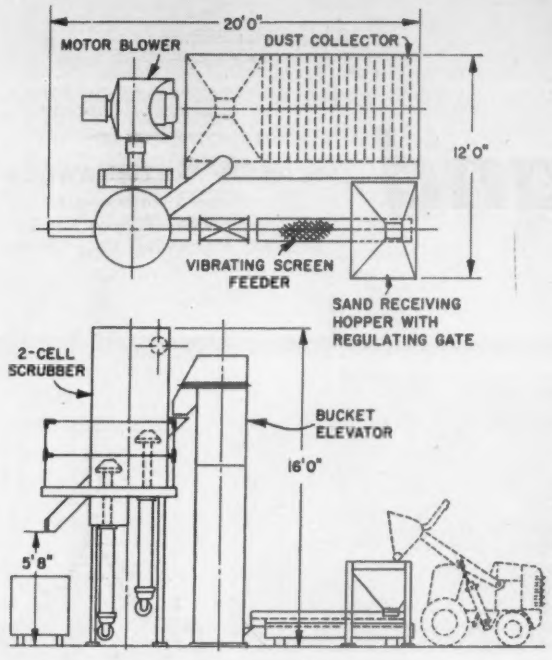


Fig. 4 (below)—Showing sequence of operations in reclamation





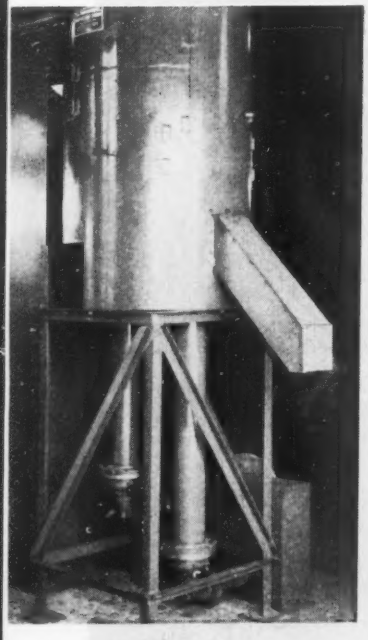
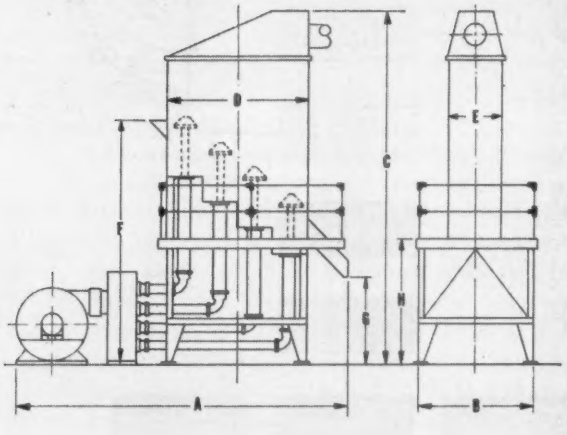


Fig. 5 (above) — This small two-cell scrubber occupies a floor space of 12 x 20 feet

Fig. 6 (left) — Illustrating part of equipment shown in Fig. 5

Fig. 7 (below)—Over-all dimensions of the four and eight-cell units



TYPE OF EQUIPMENT	A	B	C	D	E	F	G	H
4-CELL UNIT	19'0"	7'0"	20'9"	8'0"	3'5"	14'0"	5'4"	7'0"
8-CELL UNIT	20'0"	10'0"	21'0"	8'0"	6'5"	14'7"	5'4"	7'0"

scrubber is achieved by connecting the cells in step-like fashion. Slots in partitions between the cells permit sand to cascade from cell to cell. Each cell functions like an independent, batch-type unit, except that its charge of sand changes constantly as outgoing grains are replaced by incoming ones.

Layouts of Equipment—In some foundries, sand from the shakeout is carried to a large storage pile. Dry, loose sand from the face of the pile then is passed over a magnetic pulley, screened and delivered to the sand reclamation unit. Other foundries may have to install auxiliary equipment to prepare the shakeout sand properly and store it prior to reclamation.

To provide storage and to even out the flow of sand from the shakeout, a screened sand-holding hopper should be installed immediately ahead of the scrubber. A variable-speed belt conveyor or vibrating trough feeder can be used to transfer the sand from the bottom of the hopper to the receiving chute of the scrubber.

The sequence of operations in connection with sand reclamation is illustrated by the sand flow diagram in Fig. 4. Shaded boxes indicate existing sand handling equipment in most of the foundries considering sand reclamation; the solid boxes indicate sand recovery equipment. The dryer or crusher is optional for existing or new equipment.

The sand scrubber is directly connected with a dust collector which is used not only to receive the fines, but also to provide a controllable movement of air, thus permitting adherence to a pre-established sand grain distribution of reclaimed sand. The scrubber should be exhausted by an independent dust collector, not connected to any other type of equipment. An average of 1000 cfm per cell is required. In exceptional cases, when the foundry has available exhaust capacity and desires that it be used for the sand reclamation, a device controlling the negative pressure in the scrubber should be introduced between the scrubber and the existing dust collecting equipment.

The smallest self-contained unit, complete with auxiliary equipment, is shown in Fig. 5. The set-up consists of sand receiving hopper with regulating gate, vibrating screen-feeder, bucket elevator, two-cell scrubber and dust collector. This package unit occupies a floor space 12 x 20 ft with 16-ft headroom. It does not require any pits or foundations. Used sand to be reclaimed should be cleansed of magnetic refuse and screened through openings not larger than ½ x ½ in. The 4-mesh screen of the vibrating feeder will perform the secondary screening. After reclamation, the sand is deposited in a portable box. Part of the arrangement is shown in Fig. 6.

Over-all dimensions of four and eight cell units are shown in Fig. 7. The floor space required by a 4-cell unit is 7 x 19 ft with headroom of 20 ft 9 in. The eight-cell unit requires 10 x 20 ft and 21-ft headroom. Floor loads of the equipment are such that as a rule no footings are required.

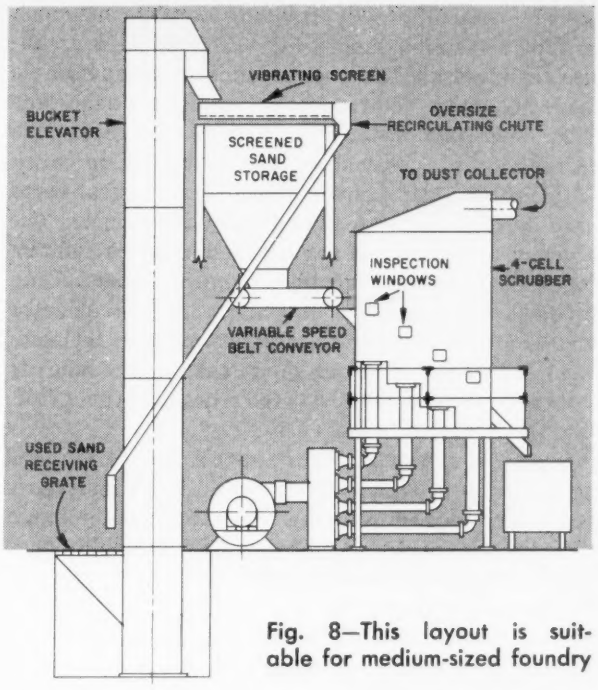


Fig. 8—This layout is suitable for medium-sized foundry

The necessary dust collecting equipment can be located either near to or distant from the scrubber, preferably outside the building. Dimensions vary depending on the make and type and are not shown in the sketch.

Layouts of sand reclamation installations described below are divided into three groups, each illustrated by two arrangements. The first group represents a completely independent setup not connected with the sand handling system. The layouts of the second group are connected with existing sand handling equipment on the sand receiving end only, used sand being intercepted at the most convenient point of the sand handling system; reclaimed sand is deposited in portable tanks. The third group exemplifies the incorporation of sand reclamation equipment into the existing system so that withdrawal of used sand and delivery of the reclaimed product are accomplished by mechanical means.

A separate layout has been added to show a battery of two scrubbers with the possibility of increasing production by addition of more units.

First Group: The sand reclamation system shown in Fig. 8 can be considered a basic layout. It consists of essential units arranged in a compact setup. This layout is suitable for a medium-sized foundry, not necessarily mechanized. The unit can be located any place in the foundry with enough headroom to house the elevator.

Used sand to be reclaimed must be reasonably dry and free from magnetic refuse. Usually it is brought to the unit by truck and dumped on a grate at the boot of the elevator. Primary screening and rejection of undesirable materials takes place there. The elevator discharges the sand into a vibrating secondary screen, screened sand falls into a storage bin, and oversized material is returned via chute or pipe onto the receiving grate, for recirculation and abrading. A feed sand storage hopper permits the scrubber to function independently of the shakeout operation.

A variable speed belt conveyor serves to feed the scrubber at a desired rate. Reclaimed sand is collected in a tote box and handled by overhead crane or by fork lift truck, and this sand usually is delivered to an elevator or belt previously used for transportation of new sand to the bin located above the sand mixing equipment.

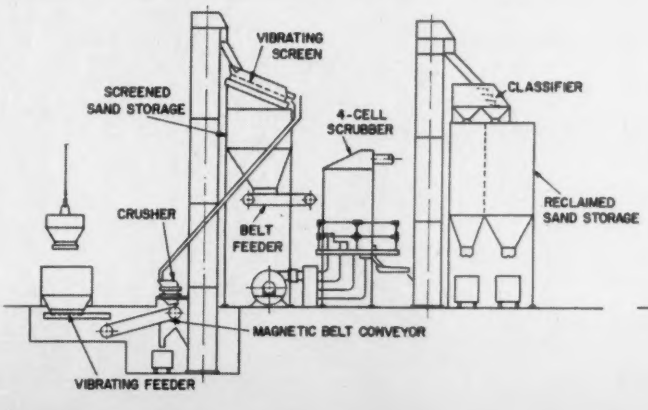
Another independent, more elaborate layout of the first group is shown in Fig. 9. This arrangement includes additional equipment for sizing feed sand and classifying the reclaimed product.

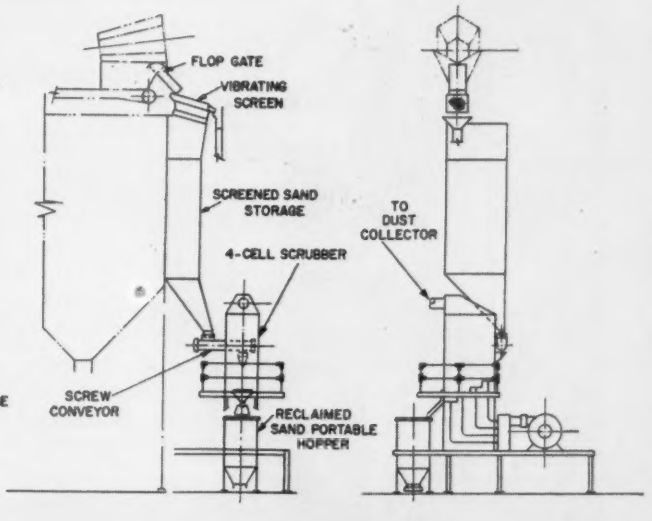
Used sand is moved gradually by a vibrating feeder, delivered to a magnetic belt conveyor, lifted by an elevator and passed through a vibrating screen. Oversized lumps rejected by the screen are returned, via recirculating chute and crusher, to the elevator. After reclamation, the sand is passed through a 20-mesh screen-feeder for final rejection of slag or scale particles, wood splinters or ceramic chips from gate sleeves.

The additional part of the installation consists of the second elevator delivering sand to a classi-

Fig. 9 (below)—An arrangement having equipment for sizing feed sand, classifying reclaimed sand

Fig. 10 (right)—Layout in which used sand receiving point is flop gate under the revolving screen





fier and of storage bins for classified products.

The purpose of the classifier is to separate and retain both fractions where the reclaimed product is a blend of two base sands. This operation improves the yield of the unit providing for the retention and reuse of the finer fraction, which otherwise would become a part of exhausted refuse. After classification, each type of sand falls into a separate storage bin and is withdrawn into movable containers as required.

Second Group: The next two layouts are connected to the existing sand handling system on the used sand only. In the sketches, existing equipment is shown in light lines and added sand reclaiming units are marked in heavy lines.

Fig. 10 shows a sketch of an arrangement where the used sand receiving point is the flop gate under the hexagonal revolving screen. From there, via chute, the sand is delivered to a vibrating screen, stored in a hopper attached to the side of the existing bin, fed by a screw conveyor into the scrubber and, after reclamation, stored in a portable hopper. Fig. 11 shows the same equipment in a foundry. It can be noted that limited floor space is required for this vertical arrangement of units.

Fig. 12 illustrates a more highly developed layout of the same group. Some modifications of the existing equipment were necessary to accommodate the sand reclamation system. The shakeout sand elevator was extended to allow for the introduction of a vibrating screen-feeder, and the existing bin belt conveyor was lengthened for delivery of the screened sand into the feed hopper. After reclamation, sand is stored in the hopper, ready to be charged into the bucket for preparation of the batch in the mixer.

Third Group: This group of layouts represents sand reclamation units connected with the existing sand handling system on both the receiving and discharge ends. In other words, it is an integral group of units providing for a continuous flow of reclaimed sand. Fig. 13 illustrates an instance in which the entire foundry production is made in cores. Normally, all new core sand was used once and discarded. Today this foundry is reclaiming the previously rejected broken cores. A magnetic belt conveyor delivers broken cores onto a vibrating screen with crusher rings. The crushed and screened sand is delivered via vibrating feeder to the scrubber, and reclaimed sand is discharged through a grate into the elevator and finally into a sand storage bin. The reclamation and cleaning room sand losses are made up by the addition of new sand through the grate, like the reclaimed sand.

Fig. 14 shows another installation from the same group in which the shakeout sand undergoes secondary screening on a vibrating feeder, then is stored in a bin and charged by variable speed belt conveyor into a scrubber. Material not passing through the screen is discharged into the old sand bin and reused for backing sand mixtures. Reclaimed sand is discharged through the grate into an elevator and transported by belt into the reclaimed sand storage bin compartment, over the mixer (not shown on the sketch).

New sand is added periodically through the same grate and conveyed by the same belt into another compartment of the main sand storage bin. The sand reclamation unit is stopped when the new sand is handled by the elevator. A similar arrangement installed in a foundry is shown in Fig. 15.

The last layout, indicated in Fig. 16, illustrates a two-scrubber setup arranged to permit adding more units to secure an increased production. A magnetic belt conveyor delivers shakeout sand onto a vibrating screen with crusher rings for preliminary screening. Next the sand undergoes a secondary screening on the double-deck vibrating screen-feeder. An elevator lifts

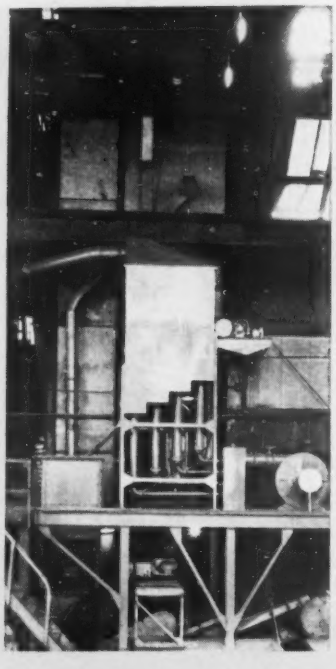
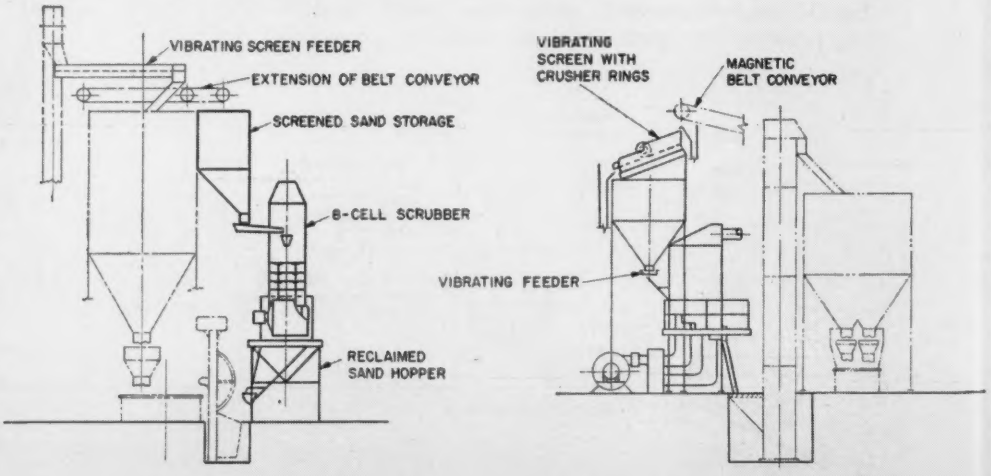


Fig. 11 (left)—Foundry installation of equipment sketched in Fig. 10

Fig. 12 (below left)—Layout more highly developed than that of Fig. 11

Fig. 13 (below right)—Installation in which all production is in cores



the screened sand and delivers it onto a belt conveyor. From there it is plowed-off into feed sand storage hoppers, equipped with sand level controlling devices electrically interlocked to stop the units located behind the bin when the sand reaches the upper level and, also, to prevent the scrubber running below capacity, by stopping all the units in front of the bin, when the lower level of sand has been reached.

Vibrating feeders with rheostat controls feed the scrubbers at a pre-established rate. Reclaimed sand from each unit is discharged into a vibrating trough conveyor to be delivered to a sand handling unit such as an elevator or belt conveyor. The individual scrubbers are piped to separate dust collectors which dispose of the collected fines via a screw conveyor to a holding hopper.

The increase of production is simply accomplished by the addition of scrubbers with auxiliary equipment and extension of used sand feeding and reclaimed sand receiving conveyors. This addition can be made without affecting the primary arrangement. A similar installation consisting of four units is shown in Fig. 17.

Cost Analysis—Initial cost of the installation depends on required capacity and necessary modifications of the existing equipment or foundry building.

Because of the simplicity of design and small number of units composing it, a dry reclamation unit is easy to install and operate. Maintenance cost is negligible. There are no moving parts inside the scrubber, and the only items to be replaced are the centrifugally cast alloy blast tubes, life of which varies from 2000 to 5000 hours. The reclamation yield varies from 75 per cent on the lowest reclamation rate to 95 per cent on the highest and depends mostly on the type of grains. Round grains usually are easier to clean. They are more durable and permit a higher yield than subangular or angular grains. The yield also is affected by the amount of bond and fines removed. If the foundry sand practice requires a considerable amount of silica flour and fire clay instead of or in addition to bentonite, the yield will be lower than usual.

With the installation of sand reclamation equipment, the foundry still will need to purchase some new sand (20 to 30 per cent of present requirements) to make up for losses in the sand reclaimer, cleaning room and dust collectors in the foundry. If the new sand requirement for the coreroom corresponds approximately with the amount of sand losses, it is advisable to continue to use new sand for cores and reclaimed sand for facing sand. This method permits running the scrubber two to three times faster than when the

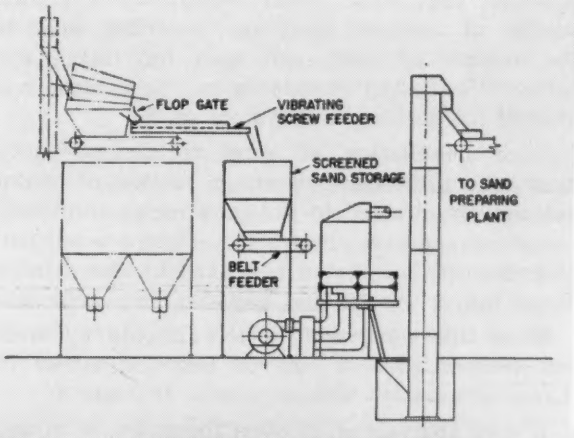


Fig. 14 (left)—In this layout, shakeout sand is screened on vibrating feeder, then stored and charged by belt conveyor into a scrubber

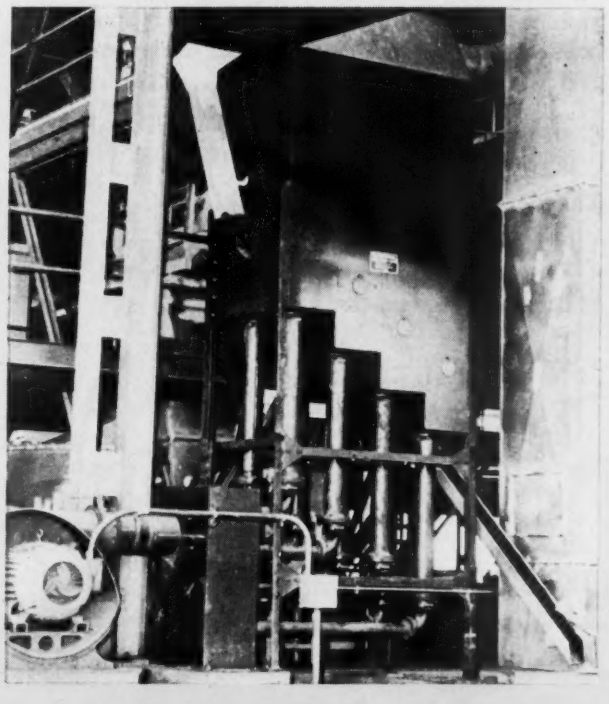


Fig. 15 (below left)—Arrangement similar to the one in Fig. 14 as installed in a foundry

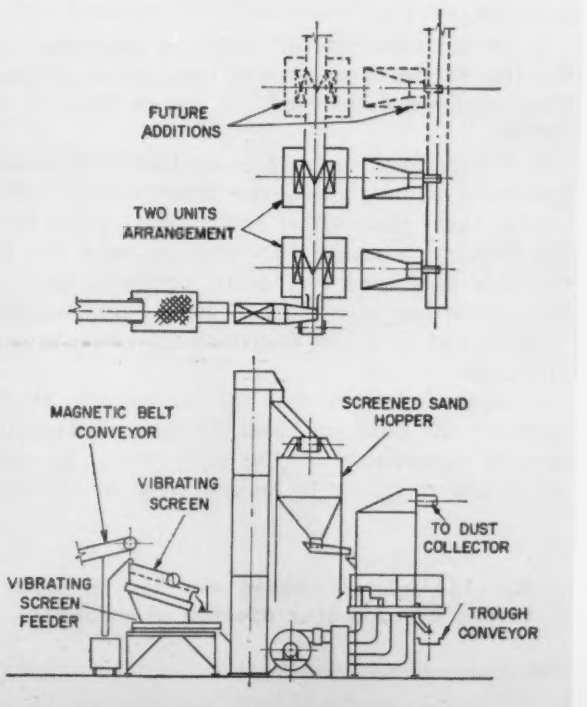


Fig. 16 (below)—Two-scrubber setup arranged to permit adding more units for higher output

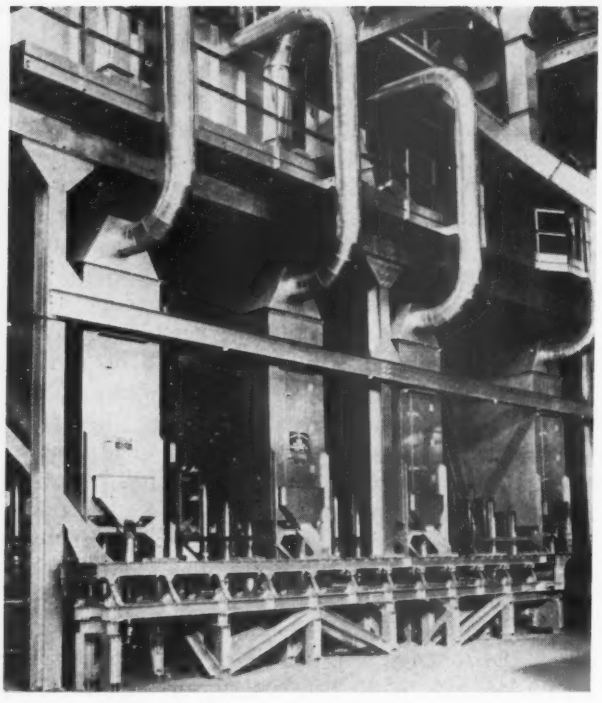


Fig. 17—Installation of four-scrubber system

sand is reclaimed for use in cores.

The cost figures discussed below are actual power, maintenance and labor costs. They represent the net operating reclamation cost and do not include interest on capital investment or depreciation of the equipment. Each foundry will have to compute these additional figures in accordance with its accounting practice.

The total expense for new sand represents the actual cost at the pit, freight to the destination point, handling charges at the plant, and additional cost of disposal of approximately an equal amount of the old sand. It varies from $5 to $15 per ton depending on the distance between foundry and sand pit, cost of handling, etc.

The net reclamation cost includes the following three items:

1. Power requirement, which is dependent on the size of the scrubber and the amount of auxiliary equipment involved. It varies from 60 to 110 kw.

2. Maintenance cost, which is limited to the replacement of one item, the blast tubes. This change takes place either about once a year, when the foundry is using round-grained sand and reclaiming used sand for facing, or up to three or four times per year when a sharp, angular sand is reclaimed at a low feed rate for reuse in core mixtures.

3. Operating labor required for periodic shakedown of the dust collector, disposal of dust and general supervision of the equipment. In most cases, the reclaimer is located close to the sand preparation plant and is supervised by the mixer operator. In general, one-quarter to one-third of the full time of one man is required.

Surveys conducted in several steel foundries reveal that the average reclamation rate for facing sand varies from 3 to 4 tons per hour with a four-cell unit. This is the most popular unit and operates with a reclamation yield of from 85 to 90 per cent. Net reclamation cost varies from 50 to 75 cents per ton of reclaimed sand.

With an estimated figure of 50 cents per ton of reclaimed sand to cover interest on capital and depreciation, the total reclamation cost at the rate of 3 tons per hour varies from $1 to $1.25 per ton. Comparison of the reclamation cost with the cost of new sand shows the great savings possible through sand reclamation.

The total savings on sand per year can be calculated by the formula $S = 0.75A(B-C)$.

In this formula, S represents savings per year, A is present new sand requirement in tons per year, B is total cost of new sand per ton and C is reclamation cost per ton. It is assumed that 75 per cent of the present new sand requirement will be replaced by reclaimed sand (factor 0.75).

Fig. 18 illustrates typical conditions in a jobbing steel foundry before and after reclamation. It shows that before sand reclamation a certain amount of shakeout sand was discarded, equal to the amount of new sand used for facing and cores. Used sand remaining in the system was utilized for backing and system sand.

Since installation of sand reclaiming equipment, the previously discarded portion of shakeout sand is directed to the sand reclamation unit, recovered and used for facing. Only a small part of previously purchased new sand has been introduced into a system and used in the coreroom.

Since this equipment is not affected by ambient temperatures it can be installed either indoors or outside, without costly enclosures.

A cost analysis of 12 steel foundries, with data available based on 2 to 4 years of operation, shows that their sand reclamation equipment paid for itself within 5 to 12 months.

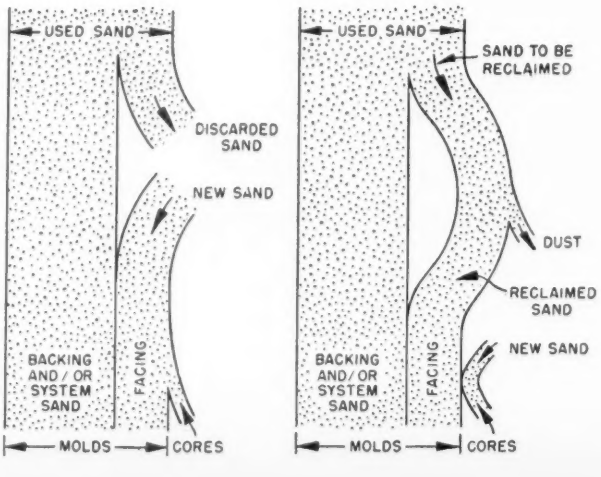


Fig. 18 (right)—Illustrating the flow of sand before, left, and after adoption of reclamation

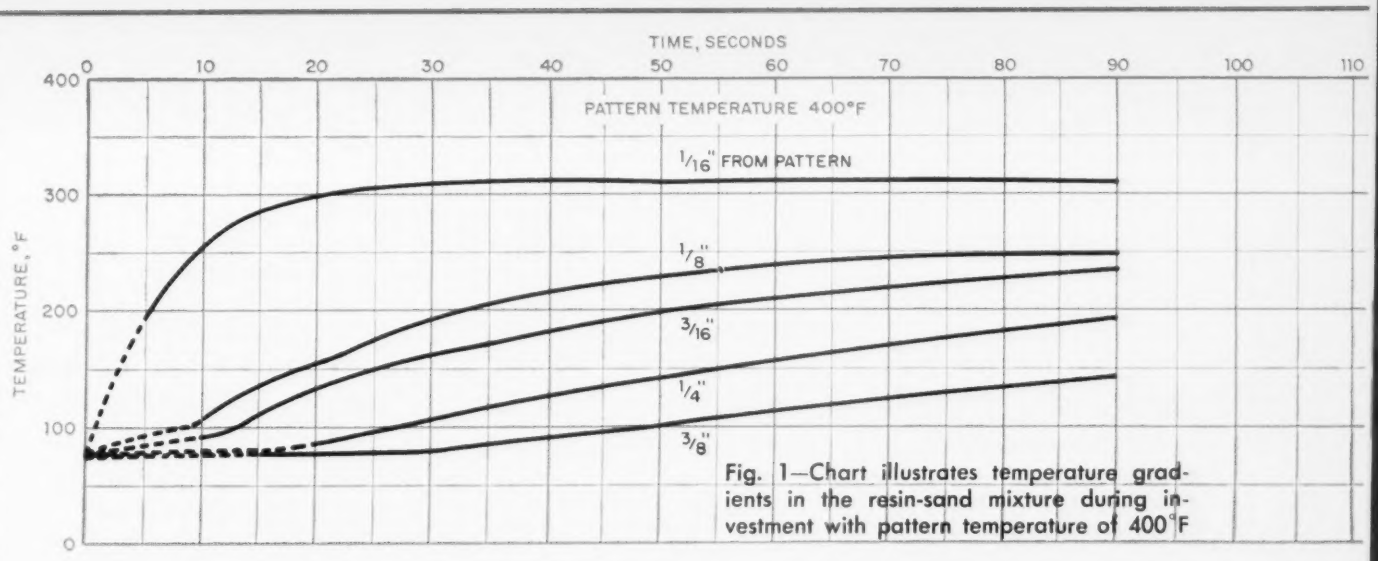


Fig. 1—Chart illustrates temperature gradients in the resin-sand mixture during investment with pattern temperature of 400°F

Thermal Studies in Shell Molding

This study of the temperature of shells during the investment, curing and pouring operations provides data which the authors believe can be a guide in the selection of correct thickness and strength of shells

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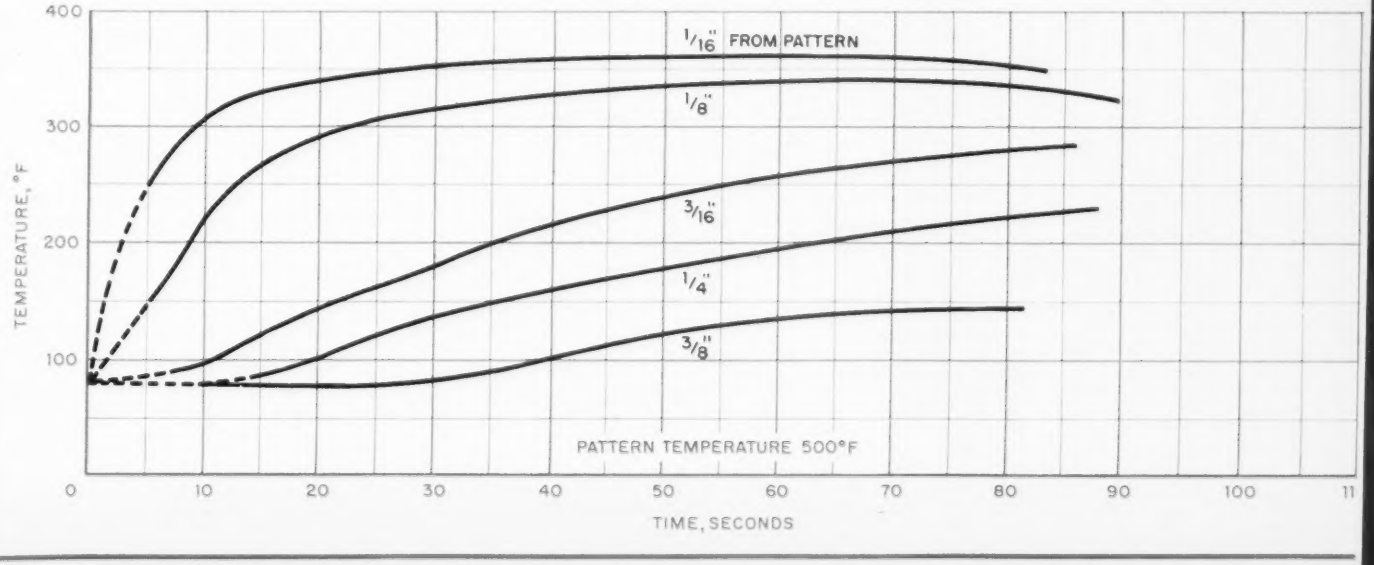
ONE of the most important considerations in the shell molding process is the rate of heat transfer and resulting temperature changes. This point applies both to making the shells and to using them for producing castings. Very little data are available on temperatures reached during investing and curing shells. This information is desirable, however, for a better understanding of the process and for best selection of operating variables in making shells.

The phenolic resin binder loses its strength at a temperature below the pouring temperature of the metals generally cast in shells. The process is possible only because of the time required for transfer of heat into the shells. Rate of temperature rise in the shells therefore is extremely important. Information on shell temperature during solidification of the casting consequently is significant. This information then can be related to data showing the residual strength of the shell

Fig. 2—Temperature gradients in resin-sand mix with pattern temperature of 500°F



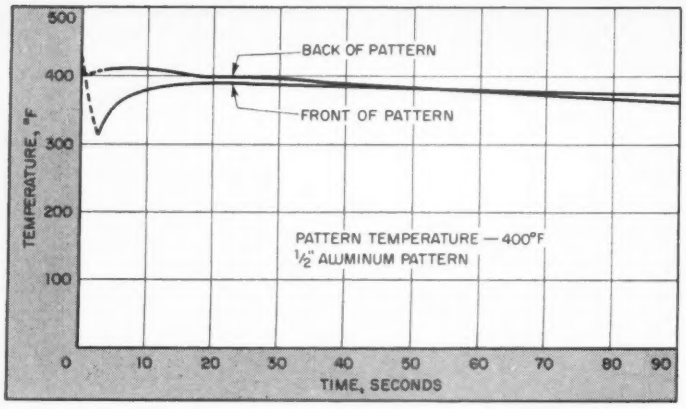


Fig. 3—Temperature loss in pattern plate during investment with initial temperature of 400°F

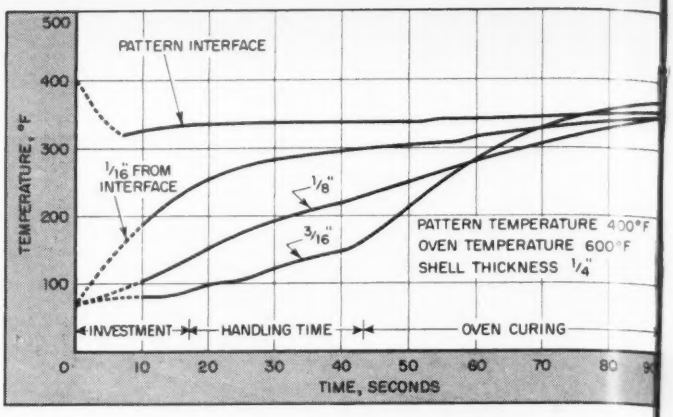


Fig. 4—Measurement of shell temperature during both the investment and the curing periods

after exposure to elevated temperature.

Equipment for Temperature Measurement—To provide rapid response to temperature changes, fine alumel-chromel thermocouple wires 0.012 in. in diam were used. Both wires were supplied with a fiber glass covering for electrical insulation. The temperature was recorded by a high-speed, multipoint, strip-chart, electronic potentiometer. When especially rapid temperature changes were involved, the recorder was adapted for use with a pen, for a continuous record of a single thermocouple.

Materials Used—A two-stage, powdered phenol-formaldehyde resin (Catalin resin 9616) with the following properties was used: Stroke cure at 150°C, 70 seconds; rigid cure at 150°C, 125 seconds; melting point (Nagel), 113°C; inclined plate flow at 125°C, 25 mm. The sand was a southern Jersey washed silica sand with the following screen analysis:

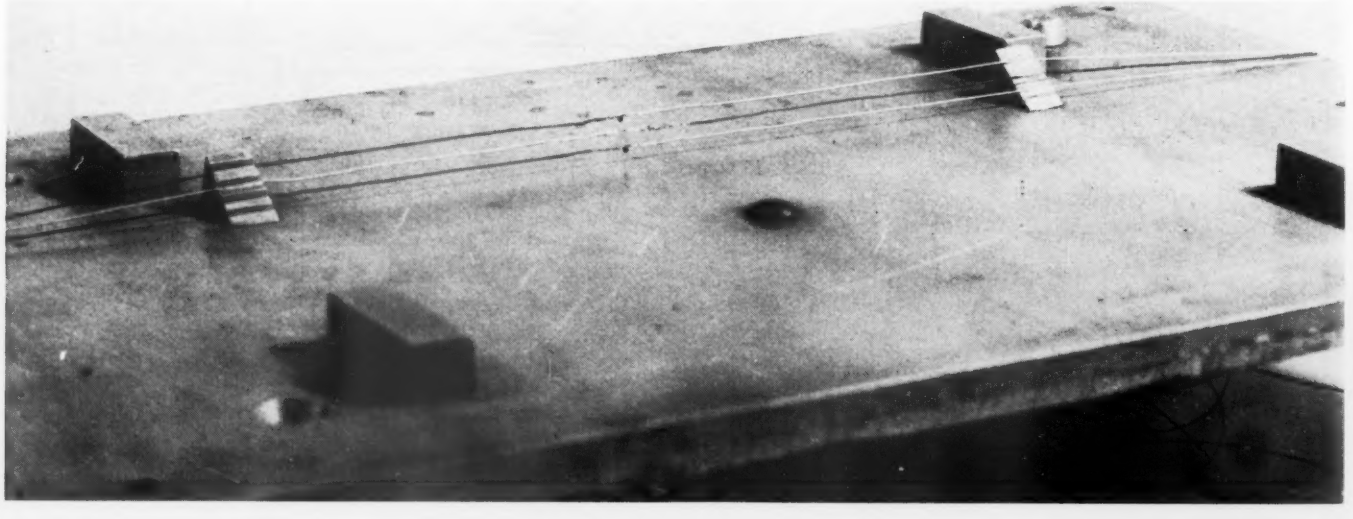
U. S. Sieve No.	% Retained
40	0.1
50	0.3
70	2.4
100	29.6
140	35.7
200	19.4
270	7.4
Pan	4.6
AFS Clay	1.2
AFS Fineness No.	114.1

In all cases a mixture was used containing 6 per cent resin by weight.

Investment Process—In the formation of the shells, the mixture of sand and phenolic resin, at approximately room temperature, is dropped on a heated pattern plate. Heat flows from the hot plate into the resin-sand mixture. The resin is softened by the heat and bonds the dry sand particles together. The distance the heat flows, which determines shell thickness, depends on the pattern plate temperature and the investment time.

It was possible to measure the rate of heat flow from the pattern into the resin-sand mixture in the following manner. A thermocouple consisting of 28-gage (0.012-in. diam) alumel-chromel wires was placed parallel to the surface of an 18 x 12 x ½-in. aluminum pattern plate, but separated from the plate by blocks. The distance was varied by using a different notch on the block. The insulated wires then were fastened to the back of the plate so that the thermocouple would not move when the plate was handled. After the pattern had been heated to the desired temperature, it was clamped in place on the dump box and the box inverted. As the heat flowed from

Fig. 5—Pattern plate used to make lower shell, showing arrangement for spacing thermocouples



the hot plate into the resin-sand mixture, the thermocouple gave a continuous record of the rising temperature. Repeating the procedure with different spacings of the thermocouple from the pattern plate gave records of the thermal change at different distances from the pattern plate. This procedure followed for initial pattern temperatures of 400, 500 and 600°F.

A series of records secured with a 400°F pattern temperature is shown in Fig. 1. The thermocouples were hot at the start of the investment because of proximity to the hot pattern plate. They therefore did not represent the true temperature of the resin-sand mixture during the first few seconds until they had cooled to the temperature of the surrounding resin-sand mixture. For this reason, the initial portions of the curves are drawn with a dashed line. As would be expected, the temperature rise was much more rapid for locations closest to the hot pattern.

The temperatures secured when an initial pattern plate temperature of 500°F was used are shown in Fig. 2. The higher pattern temperatures resulted both in a faster rate of heat transfer and consequently faster rates of temperature rise as well as in higher maximum temperatures.

Since no heat was added to the pattern plate during the investment process, it was realized that during this period the temperature would drop from the initial temperature. To determine this loss in temperature, thermocouples were attached to the front and back of the pattern plate and a record made of the plate temperature during investment. The record obtained using an initial plate temperature of 400°F is shown in Fig. 3.

Contact with the resin-sand mixture caused a rapid drop in temperature of the surface of the plate. As heat flowed from the rest of the plate to the front, the temperature rose again to about 385°F, followed by a slow loss in temperature in the whole plate. Records made for initial pattern temperatures of 500 and 600°F show much greater loss in plate temperature during investment.

It must be realized that these results for heating rates in the mixture and cooling rates of the pattern are accurate only for ½-in. aluminum patterns. Other pattern thicknesses and pattern materials having different thermal conductivities and specific heats would give somewhat different, although similar, results.

Temperature Measurements During Curing—To study temperatures in the shell during curing, a pattern identical to that employed for investment studies was used. One thermocouple was placed just touching the pattern surface, and three others were spaced 1/16, ⅛, and 3/16-in. from the pattern. These four thermocouples were then converted to the multi-point recorder. The temperature was recorded during investment and after the pattern, covered with the uncured shell, was placed in the oven for curing. The thermal records secured with a pattern temperature of 400°F and an oven temperature of 600°F with a 17-second investment period are shown in Fig. 4.

When used as a multi-point recorder, the potentiometer was not able to record the rapid temperature changes during the early stages of the investment period. The initial portions of the curves in Fig. 4 therefore are plotted with a dashed line to indicate the period in which no record was obtained. The time lag between the end of the investment process and introduction of the uncured shell into the oven is indicated in Fig. 4 as the handling time.

Several aspects of the curing process are shown in this figure. Heat flow from the heated plate into the resin-sand mixture caused a rapid drop in the temperature at the pattern interface and a rapid heating of the mixture near the pattern. The rise in temperature of the mixture continued throughout the investment period and during the handling period. Once it was in the oven, the temperature rise was accelerated, particularly for those parts of the shell farthest from the pattern and therefore closest to the radiant heating elements, which were mounted in the top of the oven. These heating units were ribbon filament type radiant elements. Temperature of the oven

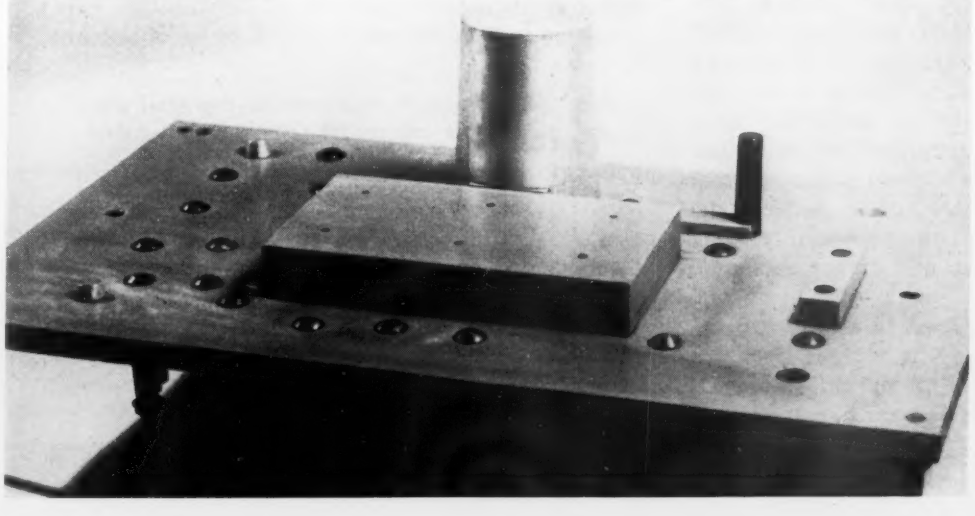


Fig. 6—View of pattern plate which was used to make upper half of shell

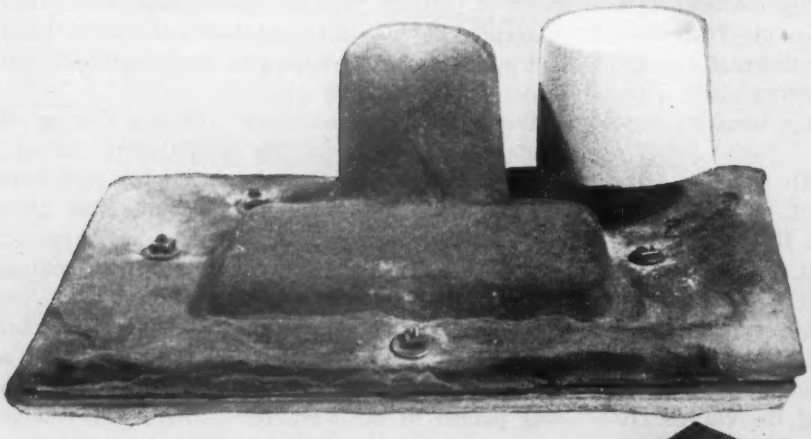


Fig. 7 (left)—Assembled shell mold with the pouring cup attached to it

Fig. 8 (right)—View of the bronze casting, 1 in. thick, showing arrangement of the gates and risers

was controlled by a thermocouple mounted in the rear of the oven, midway from top and bottom and shielded from direct radiation from the elements.

It can be seen that about 18 seconds after this ¼-in. shell went into the oven, the temperature at a point 3/16-in. from the pattern began to exceed that of a point ⅛-in. from the pattern. This rapid increase of temperature resulted in the temperature nearer the top surface exceeding even the temperature at the pattern interface, thus partially reversing the thermal gradient existing in the early stages.

It can be seen that the thermal gradient across the thickness of the shell is decreased during curing. However, excessive heat input from the top as compared to heat from the hot pattern during curing could establish undesirably high temperatures near the surface, with a consequent nonuniform cure.

Shells subjected to the same thermal treatment shown in Fig. 4 were cured after about 30 seconds in the oven. It therefore would appear that if the shell is heated to about 350°F, it becomes cured. The point at which optimum curing has occurred is somewhat hard to determine since many factors, such as shell rigidity and resistance to stress and thermal shock, must be considered.

A similar procedure with higher pattern and oven temperatures resulted in considerably higher rates of temperature rise and higher maximum temperatures.

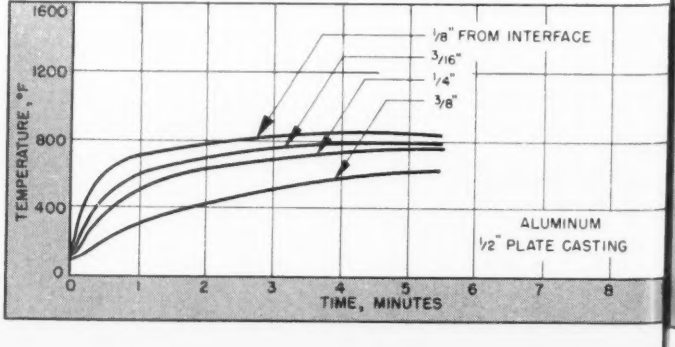
This technique could be used to establish proper pattern temperatures and heat input from the oven to insure uniform curing for different patterns, shell thicknesses and rates of shell production.

Temperatures During Pouring—To measure the rate of heating in shell molds during pouring of castings, shells were made in which thermocouples were formed in the shell itself.

To be somewhat representative, patterns for ½ and 1-in. plate castings were selected. The ½-in. plate was 3 x 5-in. with a riser 1½-in. in diam and 2⅜-in. high. The 1-in. plate was 4 x 7-in. and had a riser 2¾-in. in diam and 4-in. high. The riser was placed adjacent to the side of the plate, midway from the ends. Gating was done through a pouring cup with an ingate into the bottom of the riser. Shells were poured in the horizontal position.

The thermocouples were put into the lower shell, which was perfectly flat except for dowel locating holes. Small blocks, set wide enough apart to be outside the area of the casting, were attached to this pattern plate. A series of notches

Fig. 9—Temperature gradients in the shell during pouring of an aluminum plate ½-in. thick



was machined into these blocks to serve as spacers to hold thermocouples at various distances from the pattern surface. The thermocouples were then run over these spacer blocks with the thermocouple bead approximately midway between the blocks.

The thermocouples then were looped around the back of the pattern and secured tightly. The spacers permitted thermocouples to be spaced at ⅛, 3/16, ¼, and ⅜-in. from the pattern. When shells ¼-in. thick were made only the ⅛ and 3/16-in. thermocouple spacings were used. The thermocouple was parallel to the casting for the full width of the casting. This arrangement of the drag pattern is shown in Fig. 5. In this instance, only three thermocouples are in place. When the plate was heated, the resulting expansion was sufficient to tighten the thermocouples and thereby straighten them still more.

After the thermocouples had been fixed in their proper place, the pattern plate was heated to the desired temperature, then clamped to the dump box and invested in the conventional manner. The shell then was cured in the oven. The ends of the thermocouples had to be loosened from the fastenings in the rear of the pattern plate before the shell could be stripped from the plate. On completion, a shell was produced with thermocouples imbedded in the shell, parallel to the surface at definite distances from it.

This lower half of the shell mold was bolted to the upper half and a pouring cup attached. The mold either was simply placed on a molding sand surface for pouring or rammed up with a molding sand backing completely surrounding it. The thermocouples then were attached to the multipoint recorder. In all instances, shells were poured in a horizontal position.

The cope pattern used for the 1-in. plate casting is shown in Fig. 6. An assembled shell is illustrated in Fig. 7 with the fine thermocouple wires just visible as they protruded from the sides. A photograph of a bronze 1-in. plate casting appears in Fig. 8.

Castings were made using an aluminum alloy, a bronze and a steel. Approximate compositions (in percentage) and pouring temperatures of these alloys were as follows: *Aluminum*—3.76 Cu, 0.77 Fe, 6.4 Si, 0.34 Mn and 0.56 Zn, poured at 1400°F. *Bronze*—85-5-5-5 alloy, poured at 2000°F. *Steel*—0.48 C, 0.72 Mn, 0.48 Si, 0.04 S and 0.04 P, poured at 2750-2850°F.

Temperatures in the shell when the ½-in. plate casting in aluminum was poured are shown in Fig. 9. The temperature for each of four distances from the metal interface is plotted. It is apparent, as would be expected, that the rate of temperature rise and the maximum temperature reached are dependent on the distance from the metal interface. At a distance of ⅛-in. from the interface, a maximum temperature of 840°F was reached after 4.5 minutes. That portion of the shell in contact with the metal would have been still hotter, but ⅛-in. was as close to the surface as could be measured consistently.

The effect on shell temperature of increasing the plate casting thickness to 1 in. can be seen in Fig. 10. The rise in temperature in the shell is somewhat faster, and the maximum temperatures increased 100°F. It is apparent that the casting takes considerably longer to cool, and the shell temperature therefore is higher when the casting is solidifying.

Similar shell molds for both the ½-in. and the 1-in. plate castings were poured with bronze, and the resulting shell temperatures are shown in Figs. 11 and 12. These temperatures are much higher. For the ½-in. plate, a maximum temperature of 1250°F was reached at the ⅛-in. distance after only three minutes. Shell temperatures for the 1-in. bronze plate casting reached a maximum of 1470°F at ⅛-in. distance after four minutes.

Results shown for the aluminum and bronze castings in Figs. 9, 10, 11 and 12 were obtained with shells ½-in. thick, all poured with no backing material.

Still higher shell temperatures were obtained for shell molds poured with steel, as shown in Figs. 13 and 14. These shells were supported with a molding sand backing. A ¼-in. shell was used for the ½-in. plate casting and a ½-in. shell for the 1-in. plate casting.

Shell temperature for the ½-in. plate casting reached 1640°F as a maximum at the ⅛-in. distance, and the 1-in. plate casting showed a maxi-

Fig. 10—Temperature gradients in the shell during the pouring of an aluminum plate 1 in. thick

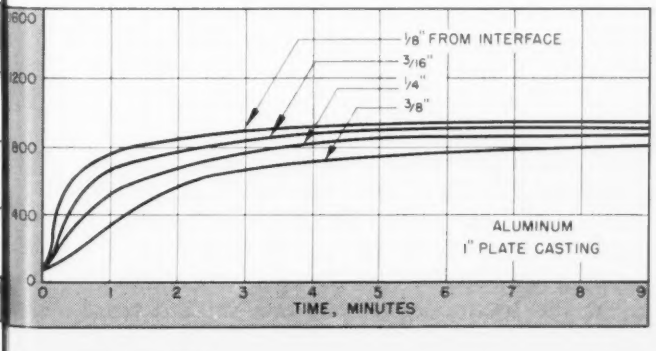
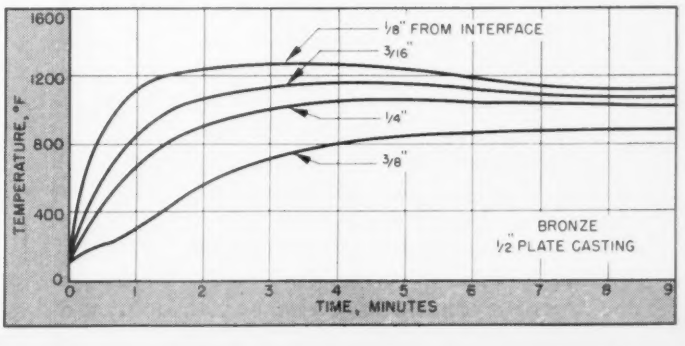


Fig. 11—Temperature gradients in the shell during the pouring of a bronze plate ½-in. thick



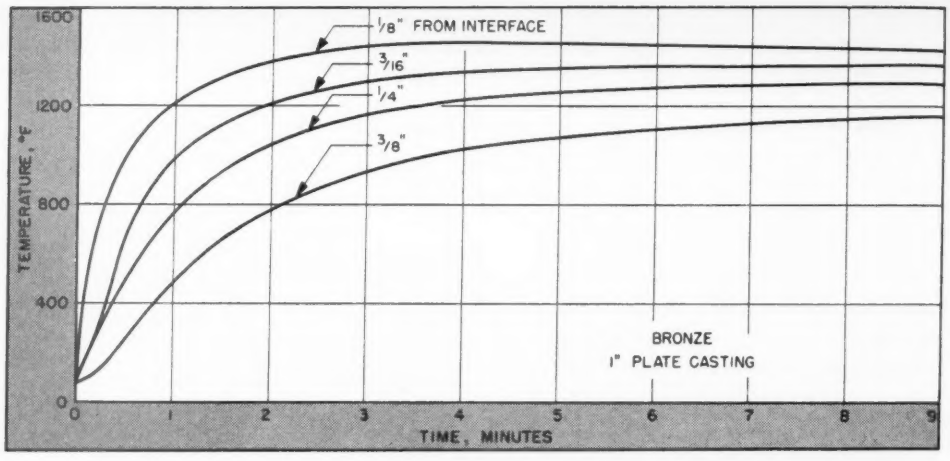


Fig. 12 — Temperature gradients in the shell during the pouring of a bronze plate 1-inch thick

mum of 2050°F. The difference in maximum temperatures for the two thicknesses was much greater for steel than for bronze or aluminum. For steel it was 410°F, for bronze 220°F and for aluminum only 100°F.

Residual Strength of Shells—Although it is known generally that resin-bonded shell molds lose strength when heated, no quantitative data were available on this loss in strength. Flexure specimens therefore were prepared as follows: A steel mold containing several cavities 1 x 4 x ¼-in. was heated to 400°F. And a resin-sand mixture containing 6 per cent resin was dumped onto the mold, completely filling these cavities.

After a few seconds, the excess material was struck off and the specimens cured in the oven. They then were removed from the mold and cooled to room temperature. Some of these specimens were heated for various times and at different temperatures in a small, resistance-type furnace and tested for residual strength after being cooled to room temperature. This method was used since it was not feasible to measure the strength of the specimens at the elevated temperature.

To know just how rapidly the specimens were heated to furnace temperature, a small hole was drilled through a specimen with the hole parallel to the 1-in. dimension and a thermocouple bead was centered in this hole. Additional thermocouples were attached to each side and a fourth placed in the furnace 1-in. above the specimen. The heating rate for an 800°F oven temperature is shown in Fig. 15. For simplification, the temperatures of the two sides, which were very similar, were averaged and plotted as one curve.

Several significant points are apparent. First, it can be seen that the specimen reached furnace temperature in 3 minutes. Secondly, the specimen temperature rose approximately 100° F above that of the oven. This rise was the result of an exothermic reaction in the resin. Examination of Fig. 15 shows that during initial heating, the center of the specimen, as would be expected, was slower in coming up to temperature. After the specimen temperature rose above that of the oven, the thermal gradient was reversed, the center of the specimen becoming hotter than the outside. This is a further proof of the exotherm occurrence.

Additional study showed that with an oven temperature of 600°F, it took 4½-5 minutes for a specimen to come to 600°F. The maximum temperature reached was 50°F above that of the oven.

With a 900°F oven temperature, 2½-3 minutes were required for the specimen to reach oven temperature, and a maximum temperature of 100°F above this subsequently was obtained.

The residual flexure strengths after exposure to the oven treatment are shown in Fig. 16. The time refers to the total time in the furnace. Part of this time was required to reach the oven temperature. On each curve, the time required for the specimen to reach oven temperature is indicated. Because of the exotherm in the heated specimen, the temperature continued to rise above the indicated oven temperature. For an oven temperature of 600°F, a maximum temperature of 650°F was reached after 6.5 minutes; for an oven temperature of 800°F, a maximum of 900°F after about 5 minutes; for an oven temperature of 900°F, a maximum of 1000°F after 4.5 minutes.

It can be seen from Fig. 16 that even after 15 minutes in the 600°F oven, almost 70 per cent of the original strength was retained. Since it took almost five minutes to reach 600°F, this would mean that the specimen was at or above 600°F for only 10 minutes. From the graph it also can be seen that it was above 650°F for 8½ minutes.

After 5 minutes in the oven, specimens at 800°F and 900°F lost slightly over half of their original strength. Since it took about 3 minutes for the specimen to reach the oven temperature, they were at oven temperature or above only about 2 minutes. The loss in strength after 5 minutes is represented by a dashed line since the strength dropped to such a low value that accurate values were not obtainable.

This loss in strength with increasing time at temperature has one advantage in that it improves collapsibility of shell cores and ease of removal of the castings from shell molds.

Relation Between Factors Tested—With a knowledge of the limitation of the resistance to tem-

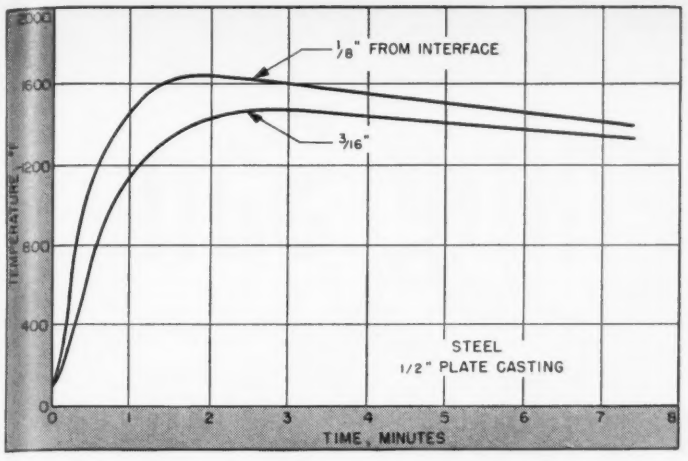


Fig. 13—Temperature gradients in the shell during the pouring of a steel plate ½-in. thick

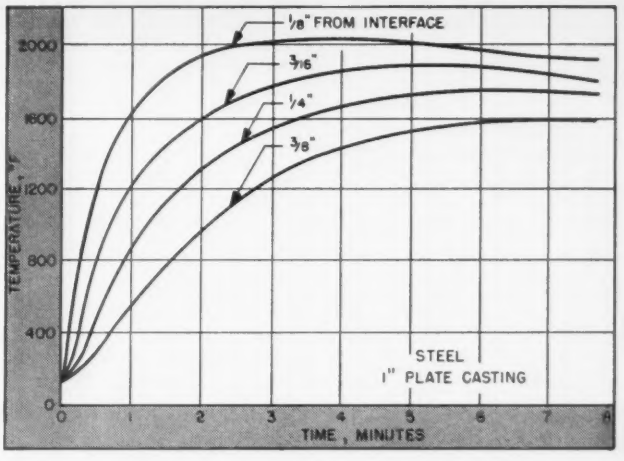


Fig. 14—Temperature gradients in the shell during the pouring of a steel plate 1 inch thick

perature of the shell, the temperature curves can be examined further. For steel and bronze, the shell adjacent to the metal rapidly reaches a temperature where there is little if any strength. However, because of thermal lag, the portions of the shell farther away from the interface have a slower rate of temperature rise and a lower maximum. Therefore the outside of the shell serves to hold the shell together while the casting is solidifying.

The temperature record for the ½-in. plate castings decreased much earlier than that for the 1-in. plate, reflecting the longer cooling time required with heavier plates. The important factor is the length of time required for a surface layer of metal to be formed which is of sufficient strength to support the rest of the casting. Pouring the shell at as low a temperature as possible, consistent with the other foundry variables, is helpful in securing this layer of solidified metal prior to shell breakdown.

When the thickness of the shells is increased, castings with heavier sections can be poured because the outside of the shell takes much longer to heat up and greater strength results. The use of a backing material such as steel shot or molding sand helps to support the shell and minimizes breaking out of the molten metal. Within the limits of this investigation, no significant differences in shell temperature were observed for shells with a molding sand backing as contrasted to those with no backing. Little difference would have been expected since the thermocouples were located in the lower shell, which was placed, in all cases, on a sand surface. If steel shot were used as a backing the resulting faster removal of heat probably would reduce shell temperatures.

For steel, because of the high shell temperatures and the low strength of the shell at these temperatures, it is only by using a very thick shell or by supporting the shell with a backing material that castings of appreciable section size can be made.

Conclusions—This type of data can be used as a guide in selecting the correct thickness and strength of shells for a given casting application. It is believed that by the use of this approach a great deal more can be learned about these operations. It may serve as a valuable basis for future process improvements.

Acknowledgements—The capable assistance of Khuong-Huu Dieu and Towar Wade, both engineering students at Lafayette College, in securing the experimental data is hereby acknowledged.

Fig. 15—Temperature record of the furnace heating of a resin-bonded residual strength specimen

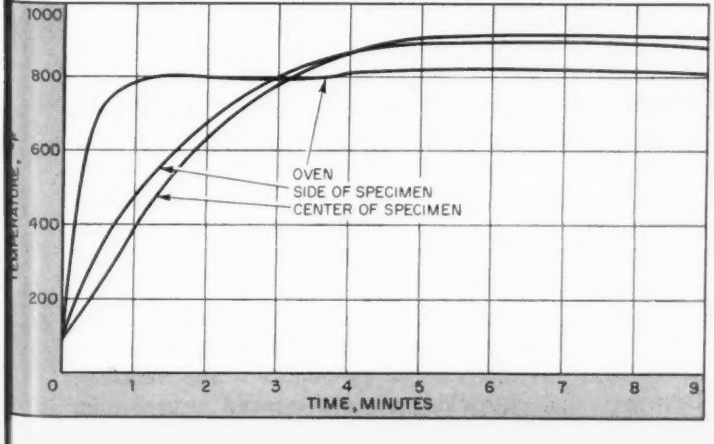
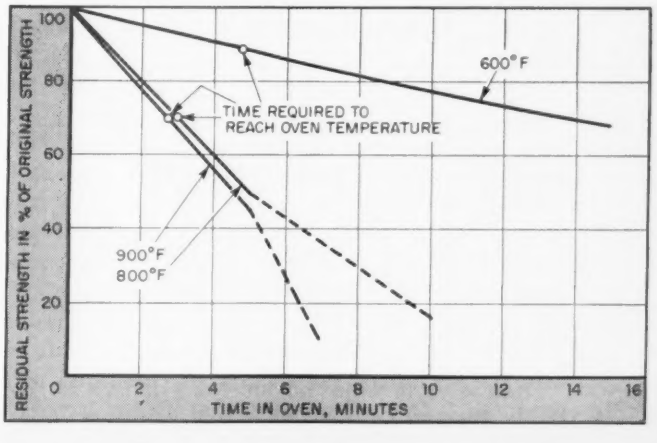
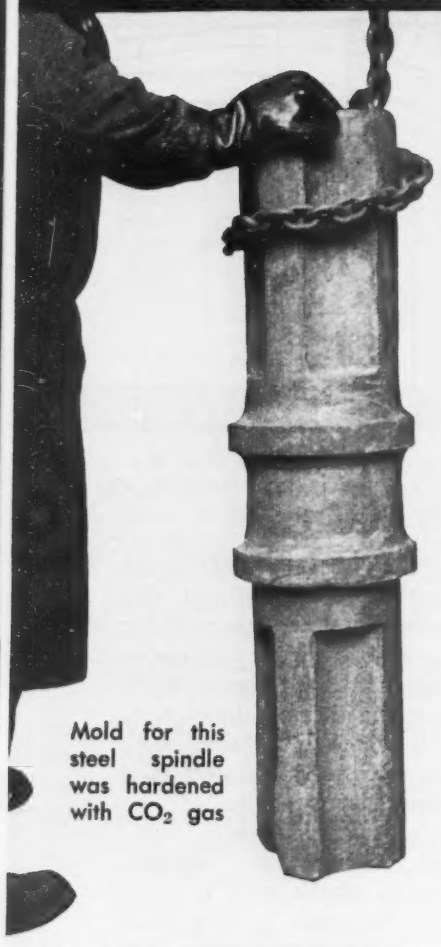


Fig. 16—The effect of temperature and time on the residual strength of the flexure specimen



Dos and Don'ts in . . .

Hardening Sand With CO_2



Mold for this steel spindle was hardened with CO_2 gas

Still comparatively new in this country, the CO_2 process has been used extensively in Europe. The authors have had wide experience with it both here and abroad and in this article have compiled a virtual manual about its use

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THE exact origin of the carbon dioxide process for hardening molds and cores is somewhat obscure. It appears to have been developed on a foundry scale in Russia and neighboring countries during the last 10 years, but it is interesting to note that the process was referred to in an English patent of 1898, although it stimulated no practical interest at that time.

Sodium silicate has been used for many years as a binder for sands, either alone or with chemicals of an acid nature which react with the silicate. Use of sodium silicate alone has never been very successful, however, probably because at high temperatures sodium silicate simply dries to a hydrated form without any decomposition, and a fluxing action occurs. This condition causes severe sintering of the sand which leads to poor collapsibility and also possibly to core and mold distortion.

In the carbon dioxide process a different set of conditions exists. Here, sodium silicate is broken down by the action of carbon dioxide to form colloidal silica gel, which gives the required bond. At elevated temperatures, silica gel loses strength and, due to this collapsibility, is much superior to the silicate mixtures used previously.

Basically, the CO_2 process is simple, but certain factors affect the quality of cores and molds produced. It is important that these factors be understood if the foundry is to use the process successfully.

Sands Used with the Process—For successful applications, a clean, dry, clay-free, cold silica sand must be used. The sand also should be relatively free from very fine particles of silica or other extraneous matter. This does not mean that fine sands cannot be bonded satisfactorily, but friable cores may be produced if large amounts of fine particles are present together with the coarser fractions. The importance of using a dry clean sand will be readily seen when the effects of clay, moisture, etc., are discussed.

Strength—Fig. 1 shows the effect of gassing time on sand compression strength. After a short time —approximately ½ to 1 minute—strength rises rapidly to about 200-300 psi. This strength is referred to as the initial set. Further treatment with carbon dioxide results in a steady increase in compression strength, but the surface hardness of the core deteriorates. A core is ready for use immediately the initial set has been obtained, but if it is allowed to stand for a short period of time, a considerable increase in strength occurs.

Rising strength of hardened cores on standing is a very important property to core practice in general, because of the possible storage of cores before use. Provided a suitable sand is used, the

hardened core increases steadily in strength. This point is illustrated in Fig. 2. During the first 24 hours, the strength increases to twice its original value and will continue to increase at a lower rate with more standing. This increase has been checked over periods of 3½ weeks, and cores have been gaining in strength after this time although at only a very low rate.

This rise in strength results from the slow rate of reaction between sodium silicate and carbon dioxide. Thus, the initial set strength of approximately 200-300 psi is obtained only by the displacement of silica gel from the outer layer of the film of silicate surrounding each sand grain. As the core is saturated with carbon dioxide, at the initial set stage, further silica gel is displaced until the carbon dioxide disperses and the concentration of gas inside and outside the core is the same. The carbon dioxide in the atmosphere carries the hardening process to completion.

If excessively long gassing times are utilized to promote high initial set strength, cores will deteriorate on standing. Therefore, if satisfactory results are to be obtained in production, it is advisable that the cores be slightly undergassed since, as already seen, the strength will rise rapidly on standing, and in this manner a strong core with good surface hardness is produced.

Binder Content vs. Sand Fineness—As the size of sand grains decreases, so the surface area of a given quantity of sand increases, thus making it necessary to use a larger amount of binder to form an adequate film around each grain.

If the amount of binder used is insufficient, a weak core will result; if the amount of binder is excessive, once again the strength will be low unless an extremely long gassing time is used. Therefore, there is an optimum binder addition to attain maximum strength for a given gassing time. These additions are shown in Fig. 3. With a range of sands of various finenesses, maximum strength is obtained with a certain binder addition.

A relationship has been found to exist between the AFS fineness number of the sand and the optimum binder content for a constant gassing time that corresponds to gas application in practice. This relationship is shown in Fig. 4.

Influence of Ramming Density—An increase in ramming density results in a slight increase in initial set strength. This fact is of little interest to the coremaker because it is practically impossible to attain ramming densities in practice as high as those obtained during experimental work. It does, however, show the necessity for tight packing of the sand at sharp edges to reduce the possibility of friability at those edges.

Influence of Mulling Time—It has been proved that a slight increase in compression strength can be obtained with very long mulling times, but this feature is most undesirable since the sands become very sticky and the surfaces of carbon dioxide hardened cores are friable.

Sands therefore should be mulled for a minimum length of time; prolonged mulling exposes,

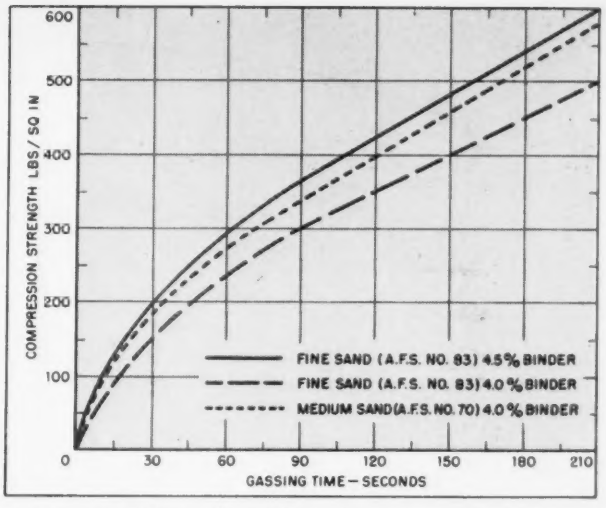


Fig. 1—Effect of gassing time on compression strength of sand. Initial set is 200-300 psi

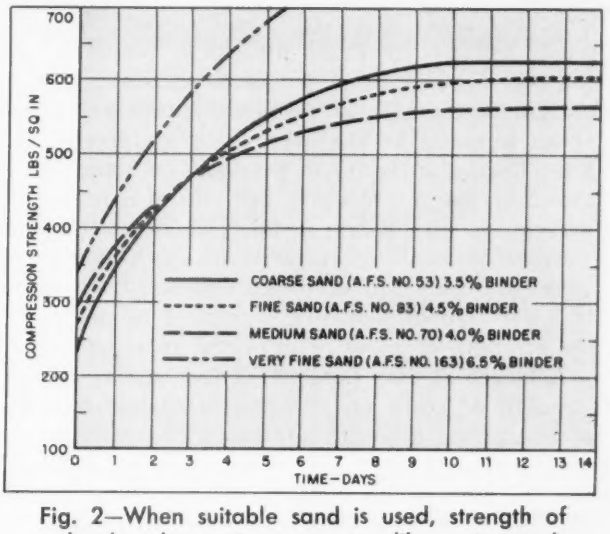


Fig. 2—When suitable sand is used, strength of a hardened core increases steadily as it stands

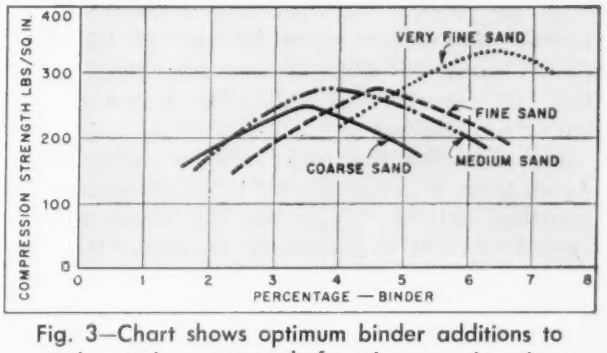


Fig. 3—Chart shows optimum binder additions to attain maximum strength for given gassing time

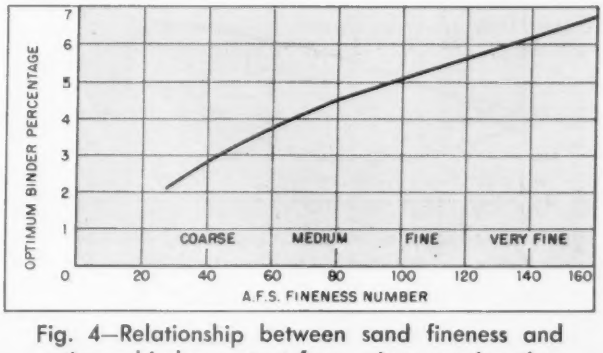


Fig. 4—Relationship between sand fineness and optimum binder content for a given gassing time

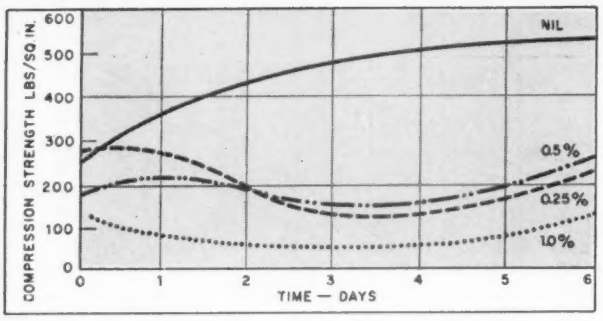


Fig. 5—Chart shows how moisture in sand causes a rapid drop in the strength of standing cores

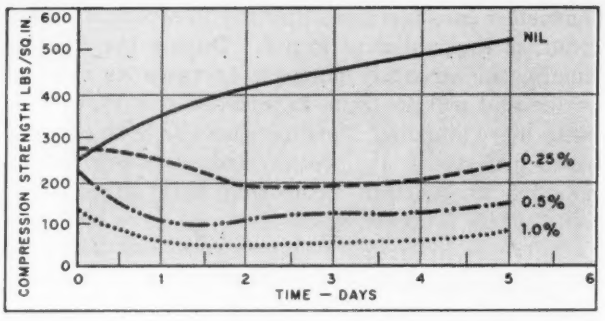


Fig. 6—As little as ¼ per cent of bentonite is enough to reduce strength of cores greatly

unnecessarily, large surfaces of sand to the atmosphere and also warms up the sands slightly. This heat causes the sand to air dry rapidly.

Influence of Moisture Content—Moisture content of the sand used is of great importance, especially with regard to the strength of cores on standing. Small amounts of water present in the sand—in the region of ¼ to ½ per cent—causes a deterioration in strength of cores on standing instead of an increase, as has been explained previously. The effect of moisture in the sand on strength is shown in Fig. 5. When ¼ per cent of moisture is present in the sand, a fairly high initial set strength is obtained, but after 36 to 48 hours the strength is only half that with moisture-free sands. If 1 per cent of moisture is present in the sand, the strength of cores deteriorates very rapidly.

Influence of Clay Content—Effect of clay on the strength of cores on standing is similar to that of moisture. Any clay present will absorb water and/or silicate from the binder, thereby weakening the film of binder coating each sand grain. This effect is most apparent when active clays of the bentonite type are present. When lower grade clays are present, the weakening is much less noticeable and larger quantities can be tolerated. Fig. 6 shows the effect of bentonite; only ¼ per cent of bentonite is sufficient to reduce the strength considerably.

Fig. 7 shows the effect of less active clays. Again there is a marked reduction in strength on standing, but not to the same degree as when a very active clay is present in the sand. It is difficult to specify a maximum clay content of a sand for use with the process. Generally the clay content of washed silica sands is low, certainly below 1 per cent, but the degree to which this clay is active has not been studied at this time. The sand used should be reasonably cold—that is, at room temperature—since at higher temperatures the sand becomes sticky and will air dry, which again produces cores of inferior quality.

With regard to the cleanness of sands, little is known at present. Certain impurities, if present in sufficiently large amounts, may react with the binder and impair the efficiency of its hardening properties. Washed silica sands are extremely clean, however, and no trouble has occurred with them. In a few isolated cases, friable cores have been produced and in every case the sands used were unwashed beach sands with a high ignition loss at 1830° F.

Flowability—The flowability of silicate-bonded sands in the green state is very high, generally between 80 and 90 as determined by the deformation test on the standard ram apparatus.

Permeability—This property of sands decreases slightly with increase of binder for a constant gassing time, as illustrated in Fig. 8. This is simply because more binder remains undecomposed and fills the available pores between the sand grains. Similarly, with constant binder content, an increase in gassing time shows an increase in permeability as indicated in Fig. 9. While this increase in permeability is not great, it is interesting to note that figures obtained on a carbon-dioxide-bonded sand are considerably higher than when conventional oil or resin binders are used.

Shatter Index and Green Strength—The shatter index figure obtained with clean carbon-dioxide-

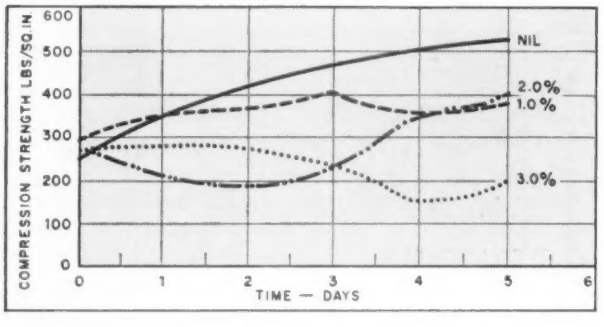


Fig. 7—Clays less active than bentonite also reduce strength of cores, but to lesser degree

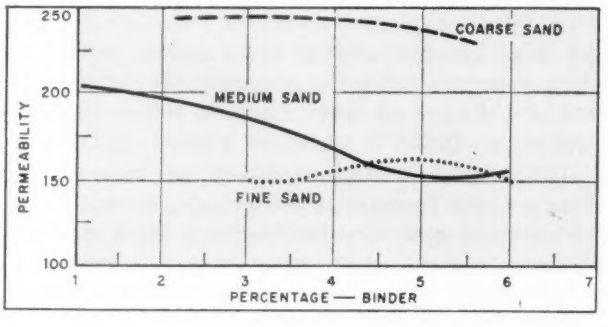


Fig. 8—Sand permeability falls slightly with increase of binder for a constant gassing time

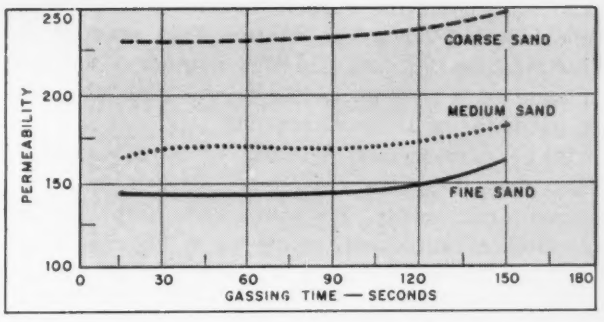


Fig. 9—With constant binder content, increased gassing time shows an increase in permeability

bonded sands is low—in the order of 60 to 75 depending on the sand used. Any increase in binder content does not materially alter these figures. Green strength is also very low, usually between ½ and 1 psi. Typical physical properties of a washed silica sand, AFS fineness No. 70 with an optimum binder addition of 4 per cent are as follows:

Mechanical Properties	After Gassing	After 20 Hours
	psi	psi
Compression strength	170	390
Tensile strength	79	118
Shear strength	35	140
Permeability	190	...
Flowability (green)	78	...

From this summary of some of the fundamental aspects of the process it is possible to answer the question, "What must we do prior to the application of the process to insure good quality cores?"

1. Be certain that sand is clean, dry and free from silt.
2. Add the correct binder content for the sand being used.
3. Mull for the minimum length of time.
4. Ram the sand tightly at sharp edges.
5. Do not overgas cores; preferably, undergas them.

Application in Practice—It should be realized that corebox and pattern design play an important part in speeding up and simplifying the process in the foundry.

When the sand is hardened in the corebox, difficulty may be experienced in stripping. In such cases, coreboxes preferably should be collapsible and should have a generous taper. Coreboxes and patterns should be completely free from undercuts and reverse tapers since the sand will key into them on hardening, making stripping impossible. Similarly, rough spots should be avoided. Rapping or vibrating the corebox before hardening greatly facilitates stripping. It has been suggested that CO_2-bonded sands expand on hardening, thus becoming tight in the corebox. Experiments have shown, however, that sands bonded in this manner are volume stable on hardening, and it is thought more likely that the pressure of carbon dioxide used has been too high, forcing the sand back onto the pattern face again.

Fig. 10—Simplest way to inject CO_2 is through vents about 6 in. apart in the body of the sand

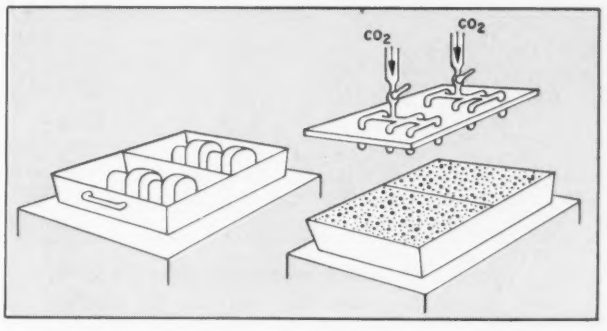


Fig. 11—Multitube manifold arrangement mechanizes the application of CO_2 gas and saves time

Where deep draws occur, stripping can be extremely difficult, and rapping prior to hardening does not ease matters. In this case it is better to use a sodium-silicate-based material giving a high green strength, which enables the pattern to be withdrawn before hardening.

Several stripping media, both liquid and powder, have been used without any outstanding improvement being shown. Fine graphite rubbed on the corebox or the pattern face appears to give the best results.

It is emphasized that the sticking which occurs is purely a locking or keying action, not the "sticking" which may occur with conventional binders when cores are stripped green. Should "sticking" occur with the CO_2 process, it is a sure sign that the surface of the core is not being hardened sufficiently.

How To Apply CO_2—This field offers the greatest scope for development. A limitation of the process in this field is the tendency of the silica-bonded sands to harden slightly due to small amounts of carbon dioxide in the atmosphere. This tendency is not serious and is easily overcome by keeping the mixed sand in a closed hopper or by

simply covering a bin of the sand with a damp sack. Theoretically, the quantity of carbon dioxide required to complete the chemical reaction when 4 per cent binder is used is 0.2 to 0.3 per cent of the weight of sand treated. But in practice a larger amount of gas is used, and efficient mechanization of gas application, therefore is essential.

The simplest method of gas application is to place vents at 6-in. intervals in the body of the sand and inject the carbon dioxide with a metal tube inserted down the vents. This practice is illustrated in Fig. 10. In this manner a volume of sand of 3 to 4 in. radius around the tube can be hardened in 15 to 30 seconds.

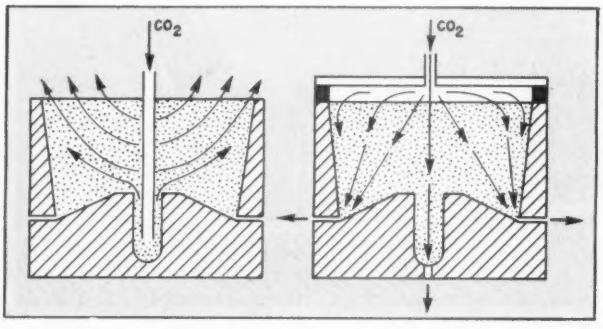


Fig. 12—When small and medium-sized cores are gassed, it may be possible to eliminate venting

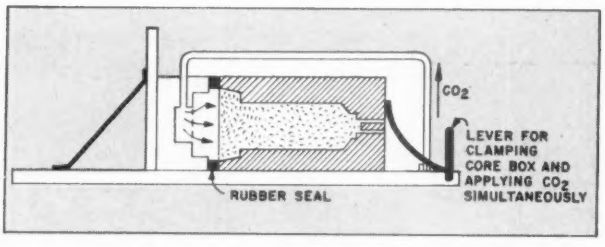


Fig. 13—For the semimechanized production of cores, an arrangement like this can be devised

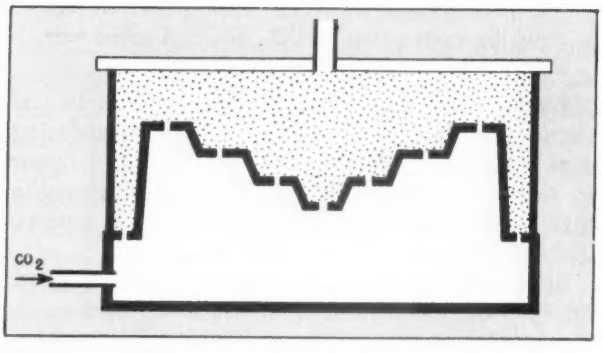


Fig. 14—When CO_2 is used to harden molds, the use of hollow metal patterns speeds production

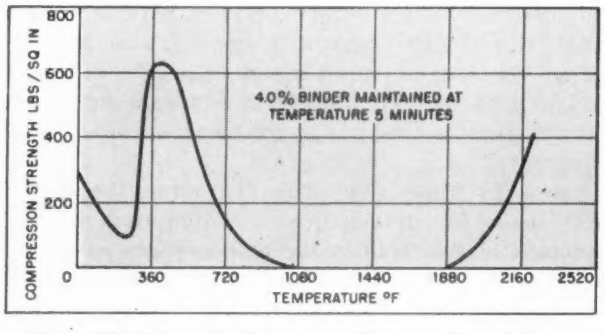


Fig. 15—Several factors affect collapsibility. Chart shows effects of temperature on strength

While this method suffices to give adequate hardening, it is time consuming. It can be mechanized quite easily, however, with a multi-tube manifold arrangement, as shown in Fig. 11. The injection tubes in this case are located on approximately 4-in. centers. With this arrangement, the entire mold is hardened in about 15 seconds and the entire operation for making and stripping the mold takes about 70 seconds.

Where small and medium sized cores are being gassed, it may be possible to eliminate venting and the single tube method of gas application and rely on the permeability of the sand to allow the gas to permeate through to the farthest sections of the core. This type of arrangement is shown in Fig. 12. It should be realized that the gas always will travel along the path of least resistance; consequently any pockets or re-entrant angles may not get the required amount of carbon dioxide, and soft spots will occur.

This situation is illustrated by the sketch on the left. When this happens it is necessary to force the gas through these pockets by cutting fine vents in the wall of the corebox forming the pockets, allowing a free passage of gas through the normally inaccessible parts. With the setup illustrated on the right, the gas is made to permeate through the core with one operation, thereby increasing the quality and production rate for this particular core.

For semimechanized production of cores, setups can be devised like the one illustrated in Fig. 13. The corebox simply is placed on the base plate of the apparatus, and the lever at the end serves to clamp the box against the rubber seals and to apply the CO_2 simultaneously. Sand bonded by this process, if mixed properly, has a high flowability and low green strength and therefore lends itself to coreblowing practice, providing air hardening is not too severe. Results depend largely on the type of machine used, but generally few problems have occurred.

The production rate of cores from a blower using the CO_2 process will be lower than with oil or resin-bonded sands because of the time spent in gassing each core in the box. This time loss can be offset by using two coreboxes, one core being blown while the other is hardened.

It would appear that coreblowing boxes are ideal from the gassing point of view because of the location of vents in the box to insure efficient blowing. It is possible, however, that the gas injection inlet may be diametrically opposite a vent in the box and so offer a path of low resistance, in which case inefficient hardening may occur in the remainder of the core. The same remarks also apply to split coreboxes and core prints which form a natural vent for the gas. These regions become overgassed, and friable cores may result.

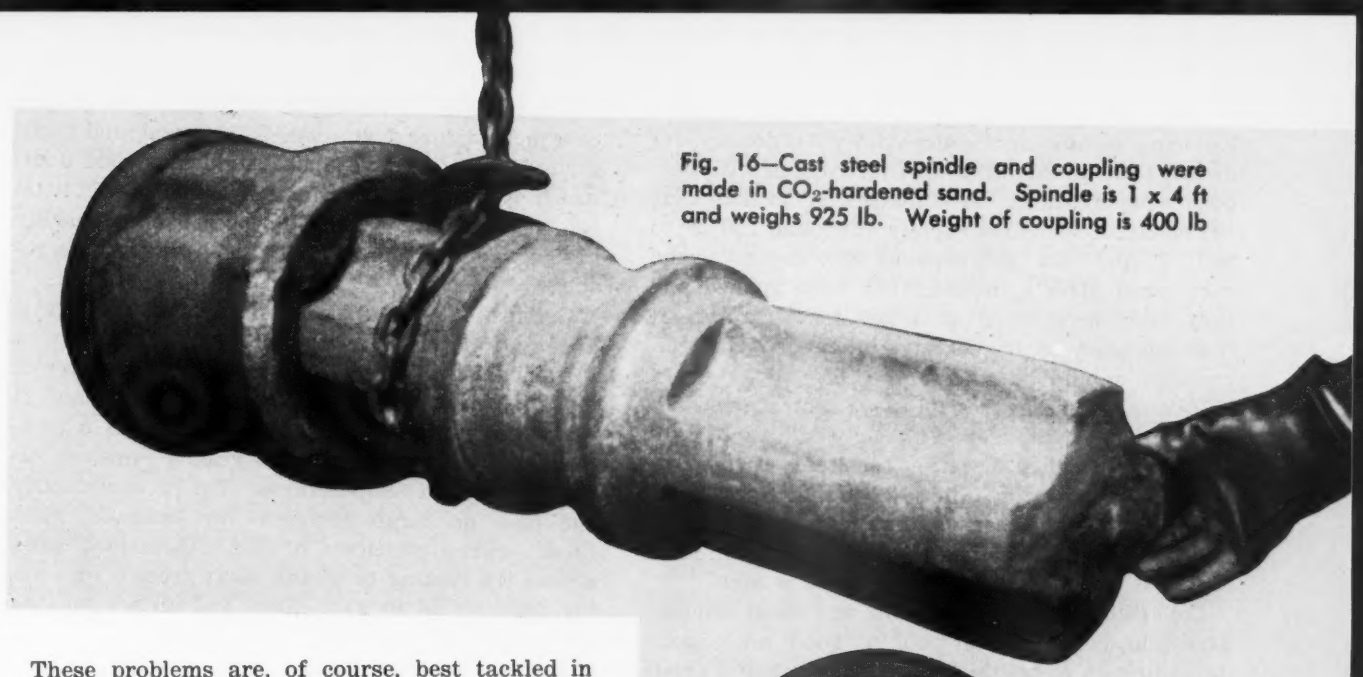


Fig. 16—Cast steel spindle and coupling were made in CO_2-hardened sand. Spindle is 1 x 4 ft and weighs 925 lb. Weight of coupling is 400 lb

These problems are, of course, best tackled in the foundry, and by suitably modifying the core-boxes, it is a relatively simple matter to overcome these troubles. With very large cores it is usual practice to form a shell core and fill the center with broken bricks, floor sand, etc. This practice can be followed with the process quite easily and can also make gassing of such a core more rapid due to the ease with which the carbon dioxide can permeate through the open structure in the center of the core.

Hardening of Molds—So far only the hardening of cores has been discussed, but hardening of molds follows very similar lines. If the mold is hardened with the pattern in place, vents may be placed through the sand towards the mold face from the reverse side and the sand mix hardened with tubes or through an airtight hood. Another method is to apply a surface layer of the silicate bonded sand on the pattern and then back up with a low-moisture-content green sand. Hardening may be effected before the backing sand is applied or afterward, provided the backing sand is vented. The second method is much less economical on carbon dioxide.

Using silicate binders which have been developed with a high green strength for the making of molds, the pattern can be removed and the hardening effected directly on the mold face with a hood. Another method, particularly applicable to small molds, is to prepare the half-boxes and strip the pattern in the normal way. Then close the boxes and inject the carbon dioxide through the runner. Any open risers in the box should be covered to prevent loss of carbon dioxide.

Another method for the rapid production of molds is to use a hollow metal pattern in the manner shown in Fig. 14. It has been suggested that hardening cores in a carbon dioxide chamber may be advantageous. At present, there seems little advantage in this method because it has been found that considerably longer treatment is necessary to attain the same strength. It is realized, however, that a considerable number of cores or molds could be gassed simultaneously with this method, and further work along these lines is being undertaken.

Fig. 17—Cast iron chill for production of rolls weighs 24,640 lb. Core was made by the CO_2 process, in two equal parts

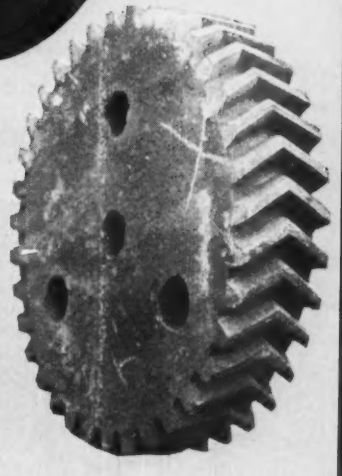


Fig. 18—Cast iron herringbone pinion is 22 in. in diam and 5 in. deep, weighs 394 lb. The mold was made by core assembly

Surface Finish and Collapsibility—Collapsibility of CO_2-hardened cores after casting is generally considered inferior to that of conventionally made cores, but there is considerable disagreement and variation in results. Collapsibility varies particularly with the type of alloy being cast, with section thickness and with the dimensions of the core itself. When sands bonded by silicate-based binders are heated, several complex reactions occur, affecting the strength of the bond markedly.

The effect of temperature on strength is shown in Fig. 15. Upon heating to approximately 390° F, cores undergo considerable increase in strength. Between 930 and 1470° F, the sand becomes completely collapsible and is still collapsible at 1650°

F, although to a lesser extent. At 1650° F partial sintering occurs and collapsibility is greatly reduced, but this condition can be avoided with carbonaceous additions. It is interesting to note that the strength decreases rapidly at around 250° F to 300° F, and this fact explains why cores become very weak after a dressing has been applied and they have been dried at a low temperature. If it is necessary to dry coatings in an oven, the temperature should be around 400° F.

Relating these figures to alloys cast, it has been found that cores used with light alloys have a good collapsibility because the temperature attained by the core is quite low. Conflicting results have occasionally been obtained with these alloys, and bad collapsibility has occurred where the ratio of metal thickness to sand thickness is high.

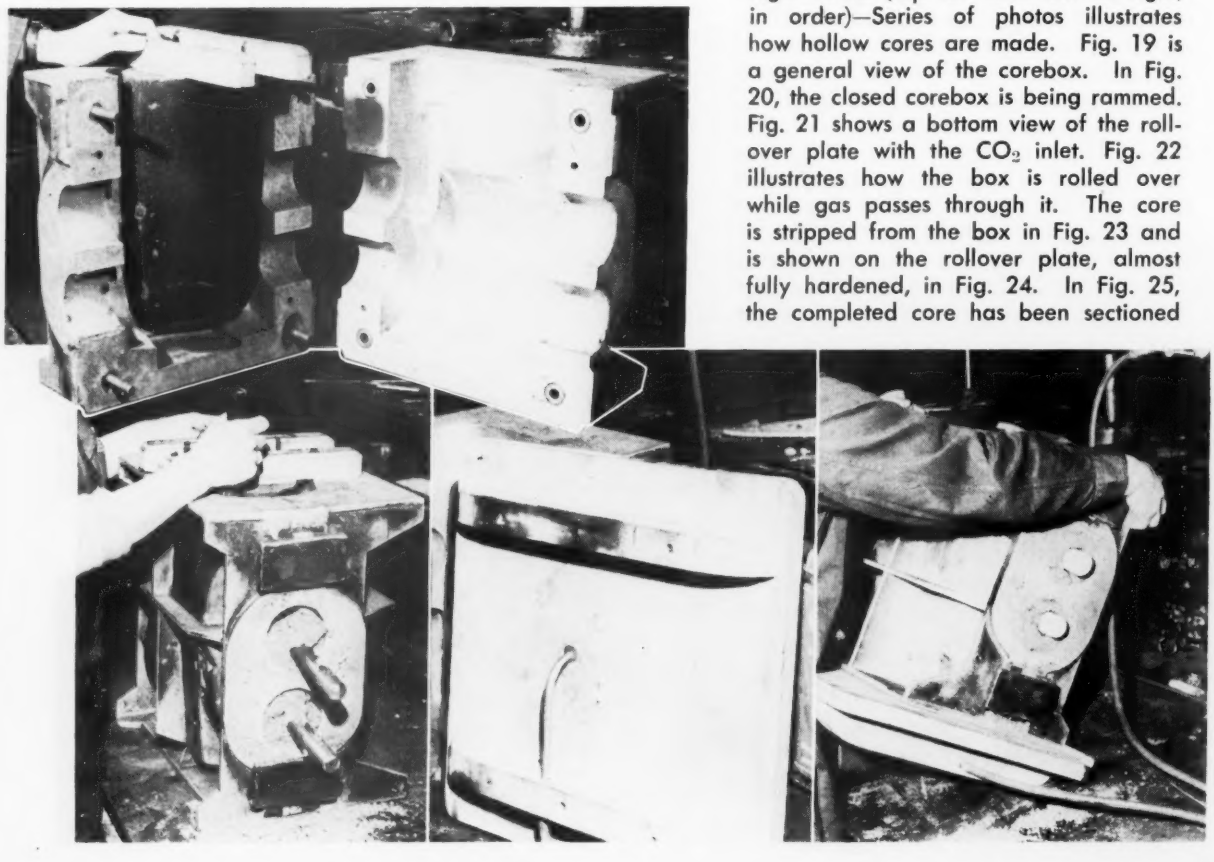
Collapsibility with cast iron and most copper-base alloys varies from poor to good, once again depending on metal thickness. However, if a small addition is made of a material which burns out or otherwise breaks the bond, good collapsibility is obtained. This addition must not interfere with the hardening process. Small additions of up to 2 per cent powdered pitch so far have been found to give the best results in both respect. If too much pitch is added, especially in big cores, the pitch in the center of the core merely melts and then hardens again as the core cools, so that the core center is even harder than it was at first.

Other additions tried with varying degree of success include coal dust, asphalt, charcoal, and high-grade fluorspar, clays and dextrines. Wood flour, which is a popular additive to sands, is of little use with the carbon dioxide process since it readily absorbs water in the binder and friable cores result.

Collapsibility of cores used for steel castings is generally good, due probably to the breakdown of the silica gel at the high temperatures encountered, but again the results are conflicting. The sand in contact with the casting fuses and forms a plastic glass-like surface which is readily removed, especially at high temperatures. This is particularly the case on large surfaces—for example, mold faces, where plasticity of the CO_2-bonded sand allows the casting to shrink away from it on cooling, forming an air gap. Strip and surface finishes are generally quite good.

Surface finish of heavy iron castings is poor unless a suitable coating and/or carbonaceous additions are made to the sand. Similar additions are made in normal iron foundry practice to provide a gas cushion at the metal-mold interface to aid surface finish. Considerable improvement in surface finish is obtained when powdered pitch is used as an additive in conjunction with CO_2-bonded sands.

The finish obtained on aluminum castings is very good and in many instances has been judged



Figs. 19-25 (top left and left to right, in order)—Series of photos illustrates how hollow cores are made. Fig. 19 is a general view of the corebox. In Fig. 20, the closed corebox is being rammed. Fig. 21 shows a bottom view of the rollover plate with the CO_2 inlet. Fig. 22 illustrates how the box is rolled over while gas passes through it. The core is stripped from the box in Fig. 23 and is shown on the rollover plate, almost fully hardened, in Fig. 24. In Fig. 25, the completed core has been sectioned

superior to those obtained with normal oil or resin sand.

In magnesium foundry practice, it is customary to add sulphur, boric acid or ammonium bifluoride to inhibit metal-mold reaction. Only sulphur should be added to sand for use with the CO_2 process. Boric acid and ammonium bifluoride are acid salts and promote premature hardening in the mixer. They therefore cannot be used. Use of up to 5 per cent of sulphur effects complete inhibition of metal-mold reaction without unduly weakening the core; collapsibility is generally good.

A wide range of coatings has been employed with success on CO_2-bonded sands. Water-based dressings of thin consistency are not particularly suitable because they tend to soften the core or mold surface, but if they are used more thickly, cores and molds may be sprayed, swabbed, etc., with care and the coating then flame or quickly stove dried.

Any spirit-base mold or core coatings may be used in the normal way since the heat generated by the burning carrier has no deleterious effect on the core.

Applications—Accompanying illustrations show a few miscellaneous castings produced in molds and cores made by the CO_2 process. The cast steel spindle shown on the first page of this article weighs 952 lb. It is 4 ft long and 12 in. in diam. Fig. 16 shows this spindle fitted with a 420-lb coupling.

A cast iron chill for the production of rolls is shown in Fig. 17. Only the core was made by the carbon dioxide process. The casting weighs 24,640 lb, and the core was made in two equal parts. The casting is 46 in. OD, 20 in. ID and 5 ft 1 in. long. The core and mold were coated with a blacking, the core being put in the oven to dry the wash. Strip in this case was excellent.

Fig. 18 shows a cast iron herringbone pinion which weighs 394 lb and is 22 in. in diam and 5 in. deep. The mold, made by core assembly, was uncoated and stripped well after shot blasting.

Figs. 19 through 25 illustrate the application of hollow cores made by the CO_2 process. It was found necessary to make hollow cores for this particular application—body cores for cylinder blocks, clutch housings, etc.—since additives did not give the desired collapsibility at the center of the core, although at the casting face it was good. Hollow cores also meant a considerable saving in the amount of silicate-based binder used.

Fig. 19 shows a general view of the corebox. In Fig. 20, the corebox is closed and in the process of being rammed. Fig. 21 shows the bottom view of the rollover plate with the carbon dioxide inlet. When the core is rammed, the center plug is stripped from the box and the rollover plate placed in position with the carbon dioxide already turned on. Almost immediately the corebox is rolled over as shown in Fig. 22. The carbon dioxide is still passing through the core, on which a crust has formed by this time, making it strong enough to withstand rolling over.

The core then is stripped from the box (Fig. 23). The core on the rollover plate, now almost fully hardened, is shown in Fig. 24. The gassing is continued to harden the core fully and the corebox meanwhile is used for another core. By the time the second core has been rammed, the first core is fully hardened and removed from the rollover plate, which then is used for the second core. The core, sectioned through to show its conformation, is pictured in Fig. 25.

This entire operation is carried out in much less time than it actually has taken to describe it, and the same principle can be applied to coreblowing.

Acknowledgments—The authors wish to acknowledge the considerable amount of assistance given by their colleagues and many foundrymen who are responsible for much of the information presented in this paper. In particular they would like to thank their colleagues, Dr. D. V. Atterton (see *Foundry Trade Journal,* May 5 and 12, 1955) and D. H. Snelson, who have contributed much basic information on the carbon dioxide process.

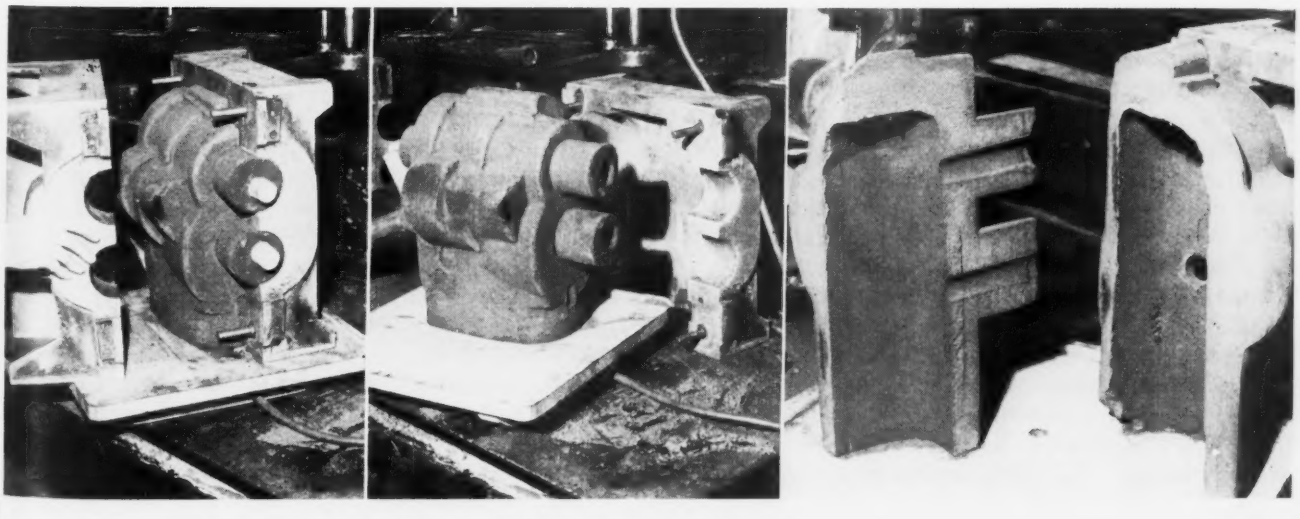


Fig. 9—In this view, bearing housing casting appears as it was removed from the mold. It was cast with two risers

Fig. 10—Second view of the bearing housing casting shown in Fig. 9, in which the risers are halved

Fig. 11—Charts and diagrams show riser calculations for bearing housing casting shown in Figs. 9 and 10

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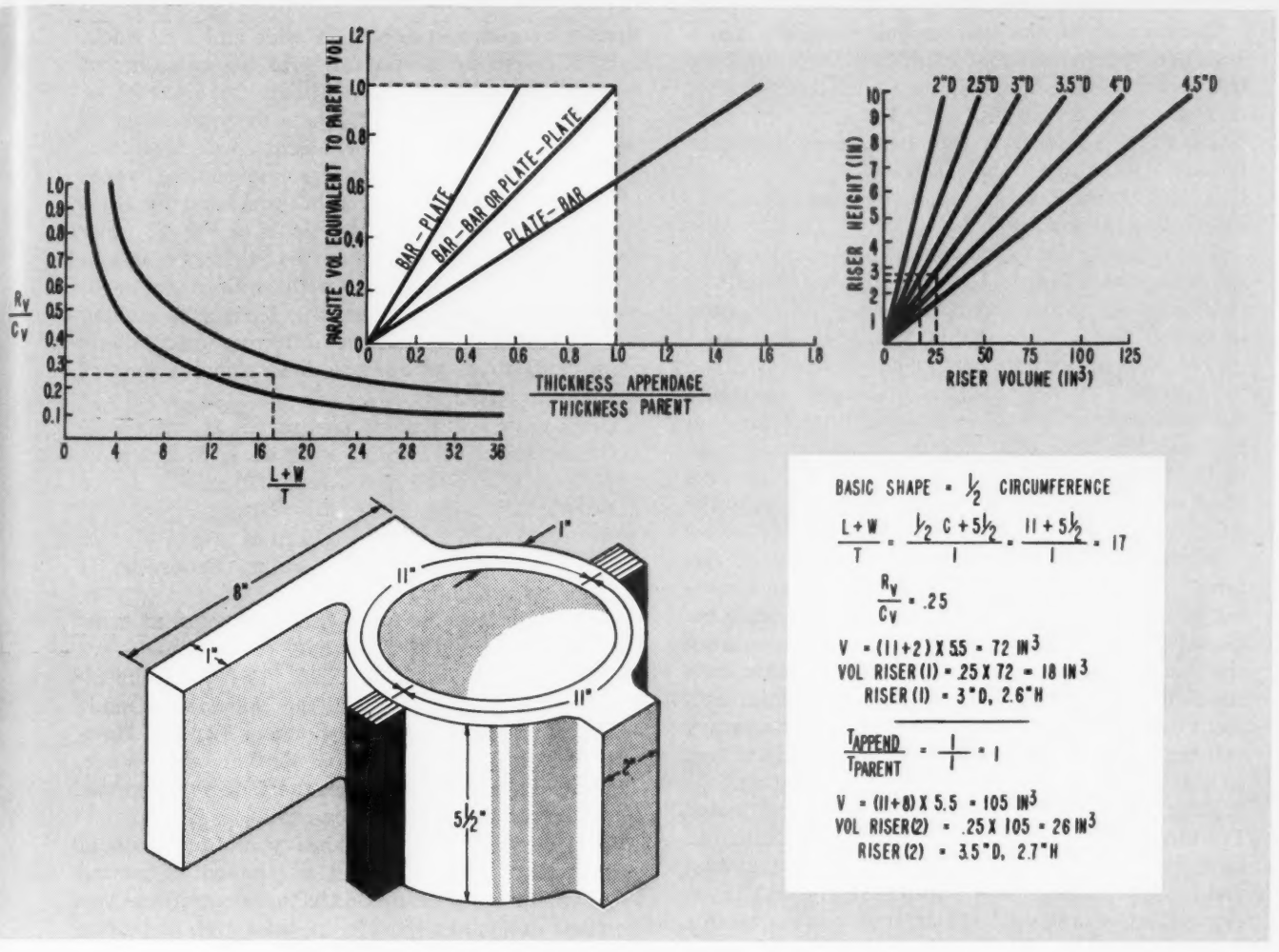
Risering of

Last month the authors explained how risers for steel castings may be calculated scientifically and gave some examples. This concluding instalment offers several more examples based on commercial-type castings

AS the first part of this article noted, a long-range project at the Naval Research Laboratory has been directed toward scientifically risering steel castings. After a discussion of how riser dimensions are calculated, the first instalment described calculations for some commercial-type castings. This instalment offers several more such examples.

Bearing Housing Casting—The bearing housing casting, Figs. 9 and 10, was fed with two risers, the dimensions of which were calculated as shown in Fig. 11. The basic or parent shape from which the shape factor measurements for each riser were made was considered to be half of the ring portion of the casting. The exact mean circumference of this ring could be calculated from the inner and outer diameters of the ring; however, it is sufficient to measure this circumference, as was actually done, by means of a tape measure laid around this portion of the pattern. Half of the circumference was found to be 11 in. Thus, 11 in. plus 5½ in., the depth of the ring, divided by the ring thickness of 1 in. gives an (L + W)/T factor of 17 indicating a relative riser volume of .25.

The two risers are feeding toward each other, and with no end effects present each riser would have a maximum feeding range in each direction, as shown in Fig. 1, of 2T or 2 in. The condition which would prevail under these circumstances is indicated in Fig. 12; to make this casting sound


PARASITE VOL EQUIVALENT TO PARENT VOL
BAR - PLATE
BAR - BAR OR PLATE - PLATE
PLATE - BAR
THICKNESS APPENDAGE / THICKNESS PARENT
Rv/Cv
L+W/T
2"D 2.5"D 3"D 3.5"D 4"D 4.5"D
RISER HEIGHT (IN)
RISER VOLUME (IN3)
BASIC SHAPE = ½ CIRCUMFERENCE
L+W/T = ½ C+5½/1 = 11+5½/1 = 17
Rv/Cv = .25
V = (11+2) X 5.5 = 72 IN3
VOL RISER (1) = .25 X 72 = 18 IN3
RISER (1) = 3"D, 2.6"H
TAPPEND/TPARENT = 1/1 = 1
V = (11+8) X 5.5 = 105 IN3
VOL RISER(2) = .25 X 105 = 26 IN3
RISER (2) = 3.5"D, 2.7"H
1"
11"
8"
1"
11"
5½"

Steel Castings

it is necessary that each riser feed for a distance of 4 in., but since they actually have only a 2-in. feeding range, shrinkage will develop. Fig. 1 shows that if a chill is located between the risers complete feeding can occur for a distance of $4\frac{1}{2}T + 2$ in., which in this case would be $6\frac{1}{2}$ in. or in excess of the 4 in. actually required. Thus, by locating chills as shown in Fig. 11, lateral feeding to complete soundness is assured.

It will be noted that the depth of this casting is $5\frac{1}{2}$ in., or 1 in. in excess of the $4\frac{1}{2}$ in. which Fig. 1 indicates that a 1-in. plate can be fed to complete soundness. This would indicate that chills should be placed along the bottom of the casting, thereby increasing feeding range to $6\frac{1}{2}$ in. This is a borderline case, however, and it was decided not to use bottom chills in this instance for the following reasons:

The risers were to be placed at locations where casting thickness is greater than 1 in. and hence a sufficient downward feeding range existed at these points. It was reasoned that feed metal could flow downward through these heavy sections and then laterally into the thinner 1-in. sections. This mechanism of feed metal flow should be accentuated by the presence of the two side chills. A secondary reason was that pattern draft was toward the top of the casting and would tend to cause a slight increase in feeding range. The validity of this reasoning was substantiated by x-ray examination which showed no shrinkage present.

In effect, the side chills divide the casting into two separate castings insofar as their solidification and feeding mechanism are concerned; and, for purposes of risering, each must be considered separately. It is also desirable that each of the two casting segments be filled from separate ingates as was done in this case, Fig. 9, so that disturbances to the gradients established by the chills are minimized as much as possible.

The smaller of the two casting segments has a 1 x 2-in. projection extending over the depth of the casting which, because of its small size, was not considered as an appendage. However, in calculating casting volume, it was included in the calculations. Note from the calculations of Fig. 11 that this segment of the casting requires a 3-in.-diam 2.6-in.-high riser to feed it.

The larger casting segment has a 1-in.-thick plate appendage attached to the parent section (half of ring section). The circular part of the casting is also a plate, although curved, and since both parent and appendage plates are 1 in. thick the chart of Fig. 11 indicates that the entire appendage volume must be considered as casting volume in the calculations. Thus, the actual volume of this casting segment, multiplied by .25, the relative riser volume, indicates that a riser of 26 cu in. or 3.5 in. in diam, 2.7 in. high is needed.

In cases such as this where two risers of different volumes are needed to feed the same casting, the risers should be chosen so that their required heights are approximately the same since the liquid metal must rise to the same level in both risers during pouring. To keep riser heights constant and still have them contain the necessary volume, it will be necessary to vary their diameters as was done for this bearing housing casting.

Ring Gear Casting—This casting, Figs. 13 and 14, illustrates the marked effect that chills can have in promoting feeding and increasing casting yield. The casting was approximately 200 in. in circumference and had the irregular cross section indicated in Fig. 13, but for purposes of calculating the shape factor the cross-sectional dimensions were assumed to be 5 in. wide and 3 in. thick.

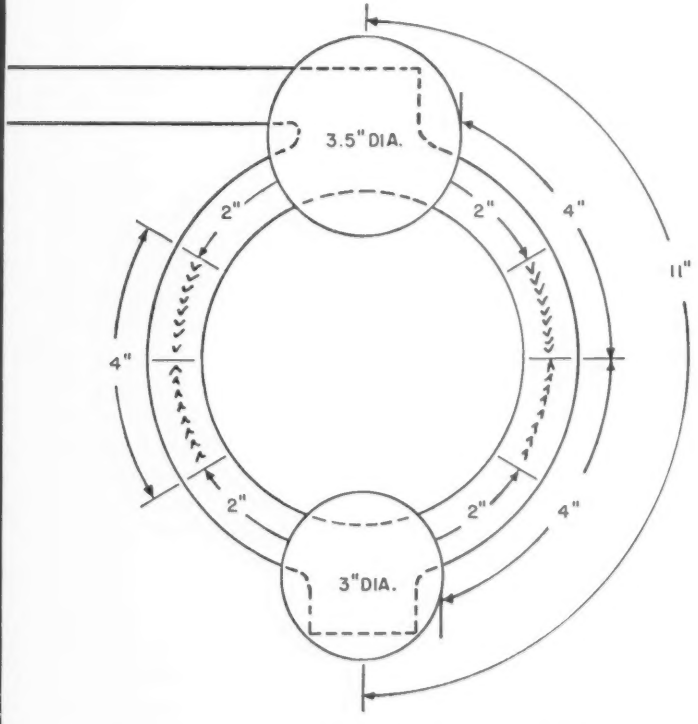


Fig. 12—Locations where shrinkage would have existed in the bearing housing casting shown in Figs. 9 and 10 if chills had not been used

Such a section would fall into the category of "semiplate" sections and without the presence of chills each riser would have a feeding range of about 4 in. (approximately equal to that of 2-in. plate, Fig. 1). To obtain a sound casting would then require that the riser be separated by 8 in. However, by using chills as shown in Fig. 13, riser feeding range is extended so that this casting can be made free of shrinkage with eight risers separated by 19 in. Each riser then feeds a 25-in.-long segment of the ring. The following calculations were made to determine the dimensions of each of the eight risers:

Cross-sectional area of casting = 15 sq in.
Cv per riser = 15 sq in. × 25 in. = 375 cu in.
(L + W)/T = (25 + 5)/3 = 10.0
Rv/Cv (From Fig. 1) = .45
Rv = .45 × 375 cu in. = 170 cu in.
Riser having volume of 170 cu in. (From Fig. 3) = 6 in. diam, 6 in. high.

Gear Segment Casting—The gear segment casting and the mold from which it was made are shown in Figs. 15, 16 and 17. The pertinent dimensions of the casting and the calculations made to determine riser sizes are shown in Fig. 18. However, before the riser size calculations were made, it was necessary to consider the feeding range aspects involved in making the casting.

This casting consists of heavy sections both at the smaller cored end and at the outer casting edge where the gear teeth are to be cut; these two sections are joined by a ¾-in.-thick web and three ribs. This casting must therefore figuratively be divided into two separate sections, with risers located on the heavy portions of each section. The thinner web section must be fed through the two heavy sections on either side of it, hence the web is an appendage to the heavy sections, not only from the standpoint of choosing riser dimensions but also from the standpoint of feeding range considerations.

In regard to the latter, the feeding range in the web is related to the thickness of the heavy parent sections as indicated by the formula shown for the case of joined sections at the bottom of Fig. 1. The feeding range in the light section is shown to be 3½ times the thickness of the heavy parent section to which it is joined. The heavy section near the cored hole is 1½ in. thick while the heavy section at the other extremity is 2¼-in. thick. Thus, the feeding range in the web in each case is, respectively,

$3\frac{1}{2}T = 3\frac{1}{2} \times 1\frac{1}{2} = 5\frac{1}{4}$ in. and
$3\frac{1}{2} \times 2\frac{1}{4} = 7\frac{7}{8}$ in.

These feeding ranges, however, apply only to cases where feeding is toward a casting extremity. An artificial edge effect can be created by chills, which in addition further extend the feeding range by 2 in. Accordingly, chills were applied to the casting along the arc indicated in Fig. 18 and also shown in the mold, Fig. 17. The chills were located 8 in. away from the gear end of the casting and 7 in. away from the circular end of the casting because, as shown in the above calculations, a greater

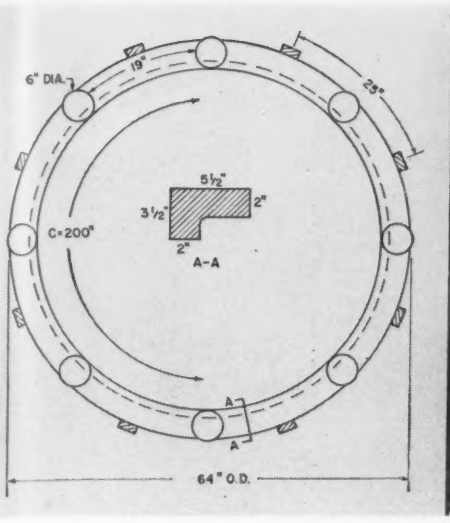


Fig. 13—Ring gear casting shows marked effect chills can have in promoting feeding. Diagram shows the location of chills and risers

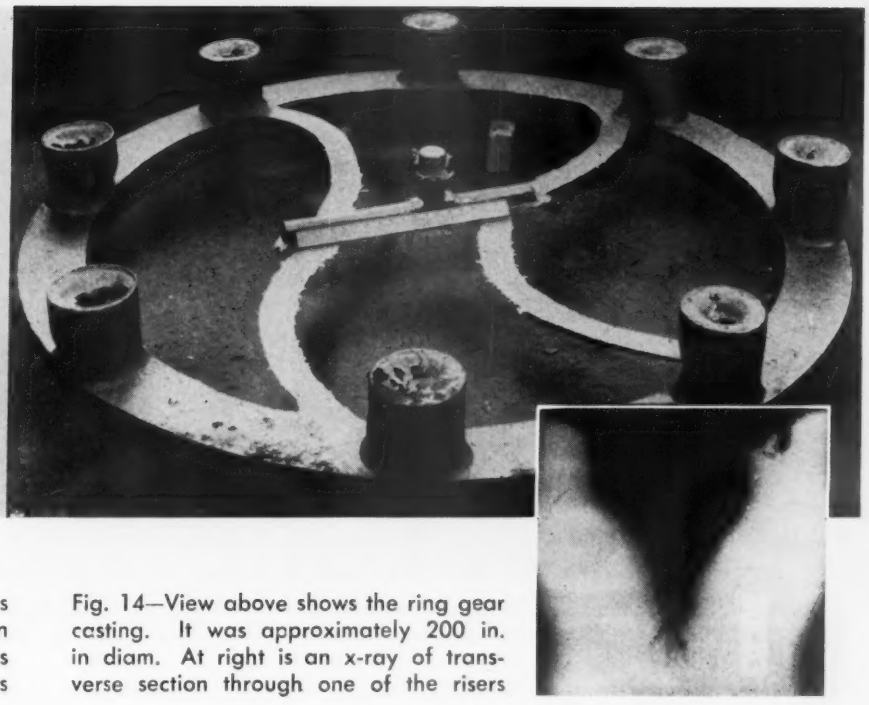


Fig. 14—View above shows the ring gear casting. It was approximately 200 in. in diam. At right is an x-ray of transverse section through one of the risers

feeding distance results from the heavier gear end. The feeding range resulting from the parent sections plus the 2-in. additional effect arising from the chills should permit complete feeding of the entire center section of the casting.

The arc of chills in effect divides this casting also into two separate components, each of which must be risered as though it were a separate casting. The heavy circular section of the casting is somewhat irregular in cross section, but is essentially 1½ in. thick, 5 in. wide, and 33 in. in circumference. It was decided to place risers on this section at the three locations where it is joined by the ribs. Since the section is fed by three risers, the length of the basic shape from which the shape factor is determined in one-third of the circumference. As can be noted from Fig. 18, the shape-factor for each riser is calculated to be 11 and the Rv/Cv ratio, .45.

Despite the fact that the risers are not spaced symmetrically around this ring section, it is assumed that each will do an equal share of the feeding. This assumption is based upon the fact that all three risers are hydraulically connected during most of the solidification period and during this time it is impossible for the liquid metal level in one riser to drop below that of the others. Between two of these risers, as can be noted from the photograph, is an expanse of casting too great to be fed completely without the use of chills. Accordingly, spot chills were placed midway between the risers as shown in Fig. 17.

The next step in the determination of riser sizes for this segment of the casting was to calculate what volumes each riser had to feed of the parent section (one-third of the ring) and the appendage section (one-third of the web section which extends to the arc of chills). To determine appendage volume no elaborate calculations were made. The three ribs were ignored since they comprised a relatively small percentage of the appendage volume.

A tape measure was laid along an arc midway between the junction of the web with the heavy section and the arc of chills to obtain the average length of this section (28 in.). Appendage volume per riser then becomes one-third of the product of the length (28 in.), the width (7 in.), and the thickness (¾-in.). For this section of the casting the parent to appendage thickness ratio is .5; and since this is a plate to plate combination the central chart indicates that half the appendage volume must be considered to determine equivalent casting volume. The calculations are continued as in the previous illustration and show that the risers should be 4 in. in diameter and 3.7 in. high.

The feeding ranges shown in Fig. 1 were determined only for true plate and bar sections as defined by their heat transfer characteristics. The actual basis of these definitions need not be discussed here but a plate is considered to be of uniform thickness and having length and width dimensions of at least 5T, (5 times the plate thickness). A bar section is considered to have a symetrical cross section, such as a circle or square, with a length of at least 5T. Both of the heavy sections in the gear segment casting are neither true plates nor bars according to these definitions.

The circular section has a width of 5 in. and, since T in this case is 1½-in. its width is less than 5T; the parent section at the gear teeth end of the casting is 2¼ in. thick with a width dimension of only 4 in. These sections are called "semiplate" sections the feeding range characteristics of which have not been determined accurately. In the absence of such data, the circular section is considered to be a plate, both in regards to feeding range and for purposes of determining equivalent volume

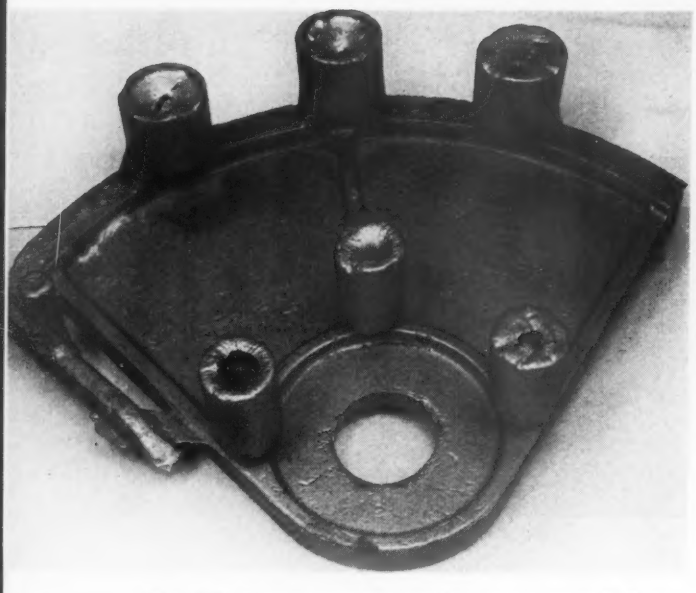


Fig. 15—Gear segment casting as removed from the mold. Note location of the heavy sections

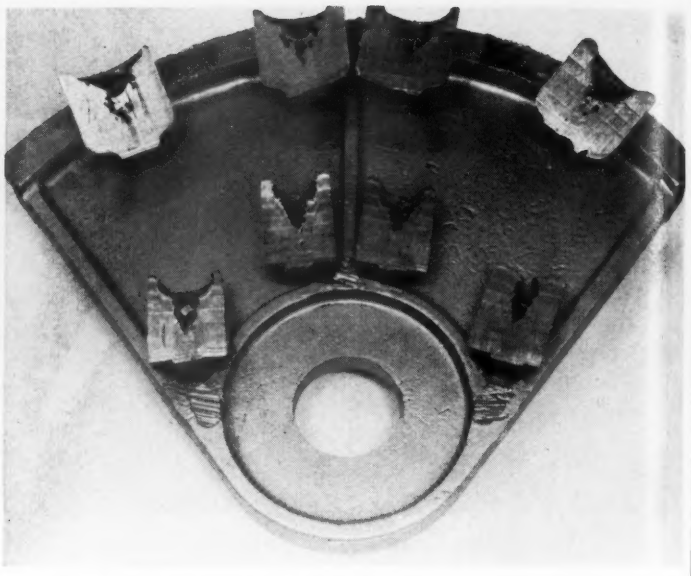
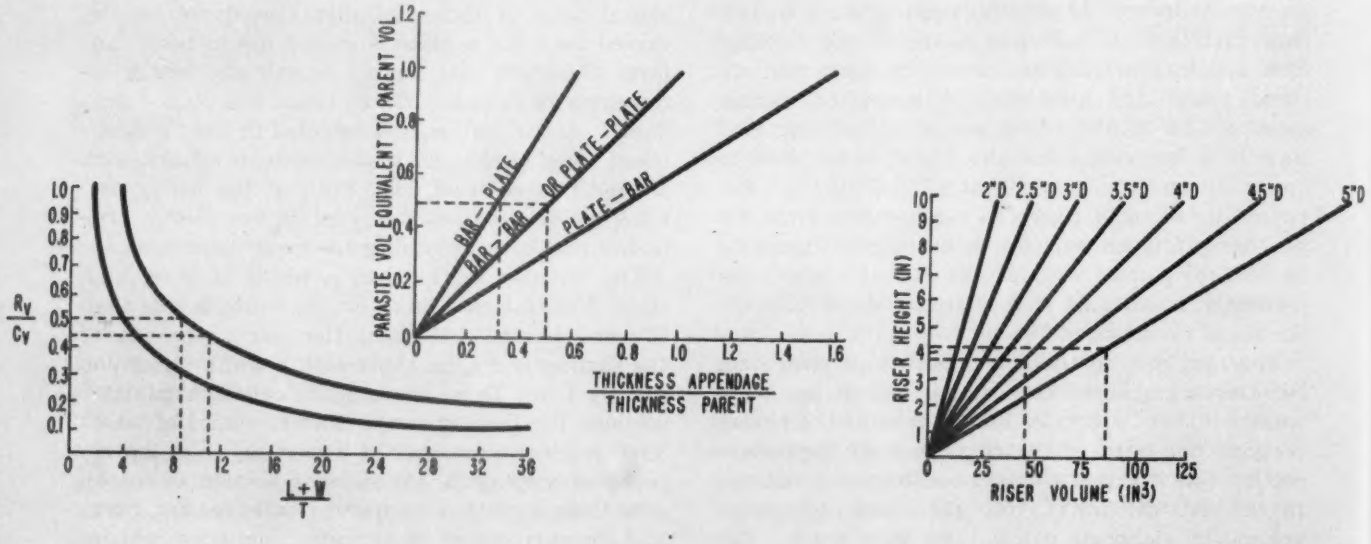


Fig. 16—Another view of the gear segment casting shows it after risers have been sectioned

of its appendage section, since its geometry is more nearly that of a plate than a bar. The opposite heavy section, however, is considered to be a 2¼-in. bar because its width dimension is relatively small—less than 2T.

The feeding range in a bar with no end effects, Fig. 1, is 1½T, or for the case of the gear segment casting approximately 3½ in. (2¼ × 1½). With end effects present feeding range is $6\sqrt{T}$ or approximately 9 in. ($6\sqrt{2\frac{1}{4}}$) for this section. Thus, three risers are sufficient to feed this segment of the casting. The risers are located so that the distance between them is 7 in. (requiring a feeding distance of 3½ in. per riser). Using 5-in.-diam risers, the distance which each of the two outer risers must feed toward the section extremity is 8 in., which is within the 9-in. maximum.

Calculations for this segment of the casting were made in the same way as were those of the first segment. Again an average length of the appendage, 40 in., was determined by laying a tape along an arc of this section; thus, the appendage section is equivalent to a rectangular plate 40 x 8 x ¾ in. The thickness ratio of the appendage to parent sections was found to be .33 and, since the parent section is considered to be a bar, the bar-plate line on the equivalent volume chart is used to determine the appendage volume to be used. This shows that half of the appendage volume should be used in the riser size calculations. Since the height of the risers needed on the first section is determined to be 3.7 in., the riser heights on the second section should also be of this height. Risers 4¼ in. high which are 5 in. in diameter were chosen as a close approximation to 3.7 in. To obtain a height of 4¼ in. in the risers on the



bar shape, the risers on the circular shape must also be filled to this level, making them approximately ½ in. above the calculated height.

It will be noted that the parent bar section of the casting, Fig. 18, rises about ¾-in. higher into the cope of the mold than does the parent plate section at the opposite end of the casting. This difference would normally be considered in choosing riser heights for the two segments of the casting; that is, the risers chosen for the bar section should be ¾-in. shorter than the risers chosen for the plate section so that they would be filled to the same level and still have the required height. However, in this casting the risers on the circular plate were necked down with a neck also ¾-in. in height, which brought the bottom of all risers to the same level. Thus, this adjustment was unnecessary.

Adjusting Riser Dimensions—All of the risers chosen for the castings described were sufficiently large and placed in a manner to produce castings free of shrinkage. The shrinkage cavities in some of the risers shown in the illustrations indicate that the risers may be excessively large; this may be expected since relative riser volumes were chosen from the top regions of the shape factor—relative riser volume band, Fig. 2.

It has been observed in previous studies, however, that determining the adequacy of a riser by simply sectioning and visually observing it may be misleading. Quite often the riser is not sectioned through the lowest point in the pipe which is not apparent on a saw-cut surface. In cases where a large number of castings are to be made and it is desired to obtain maximum yield, x-rays should be made through 1-in.-thick vertical sections removed from the risers of the first few castings made. By this method the lowest point of shrinkage in the risers would be detected and if it were found that a portion of the bottom of the risers were sound, the height of subsequent risers would be reduced by this amount.

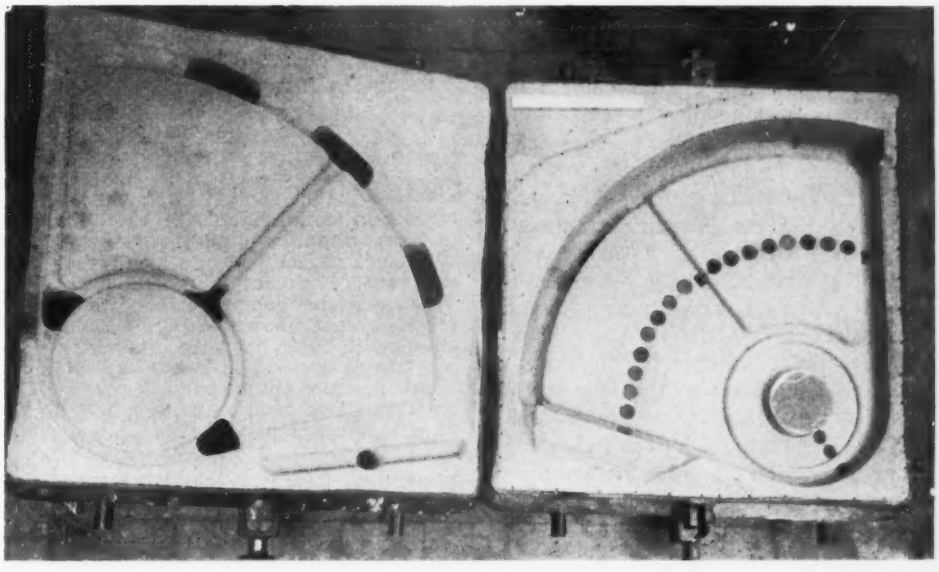
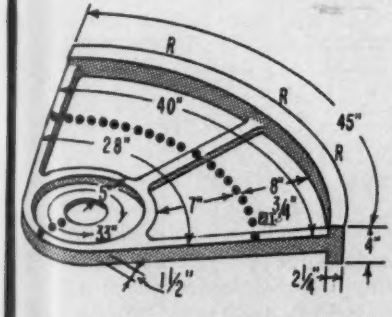


Fig. 17—View of mold for gear segment casting shown in Figs. 15 and 16. Chills were applied along the arc which appears at the right

Fig. 18 — Riser calculations used for gear segment casting. Pertinent dimensions of casting also are shown



BASIC SHAPE PER RISER = 1/3 CIRCUMFERENCE
(1.5"T, 15"OD, 5"ID), C = 33"

$\frac{L+W}{T} = \frac{11+5}{1.5} = 11$

$\frac{R_V}{C_V} = .45$

VOL PARENT/RISER = $[\pi(7.5)^2 - \pi(2.5)^2]1.5/3 = 78\ IN^3$
VOL APPEND/RISER = $(.75 \times 7 \times 28)/3 = 50\ IN^3$

$\frac{T_{APPEND}}{T_{PARENT}} = \frac{.75"}{1.5"} = .5$

EQUI VOL OF APPEND = $.5 \times 50 = 25\ IN^3$
EQUI CASTING VOL = $78 + 25 = 103\ IN^3$
RISER VOL = $.45 \times 103 = 46\ IN^3$
RISER = 4"D, 3.7"H
THREE(3) REQUIRED

BASIC SHAPE PER RISER = 1/3 OF ARC
(45" X 4" X 2.25")

$\frac{L+W}{T} = \frac{15+4}{2.25} = 8.5$

$\frac{R_V}{C_V} = .5$

VOL PARENT/RISER = $15 \times 4 \times 2.25 = 135\ IN^3$
VOL APPEND/RISER = $(40 \times 8 \times .75)/3 = 80\ IN^3$

$\frac{T_{APPEND}}{T_{PARENT}} = \frac{.75}{2.25} = .33$

EQUI VOL OF APPEND = .5 OF TRUE VOL = $.5 \times 80 = 40\ IN^3$
EQUI VOL (CASTING) = $135 + 40 = 175\ IN^3$
RISER VOL = $.5 \times 175 = 87\ IN^3$
RISER = 5"D, 4.25"H
THREE(3) REQUIRED

Questions and Answers

Leaky area in heavy section of brass valve casting caused by lack of proper feeding . . . Wants information on olivine as a molding material . . . Variety of substances is employed for the coating of permanent molds . . . The term, follow board, often is applied loosely . . . A number of alloys are used for making statuary

Suggest Change in the Gating

QUESTION We are sending you several toilet flush valves we are making from semi-red brass ingot containing 76 per cent Cu. Also we are including a rough sketch of our method of gating. From the accompanying fractured specimens you can see the poor structure which causes as high as 50 per cent leakers. Can you tell us whether the difficulty is due to gas from the cores, gassy metal, or inferior metal?

ANSWER Cause of the defects in the castings is not due to the factors you mention; it results from shrinkage caused by lack of proper feeding. In your present method of gating, the metal enters through the thinnest section of the castings. This section solidifies long before the heavier section, which is approximately twice as thick.

Remedy, of course, is to change the gating system so that the metal enters and feeds the heavy section. We are enclosing a sketch indicating our conception of a suitable arrangement. You will note that the runner, ⅝-in. square, is located in the drag with the gates in the cope which, according to experimental investigation, provides clean metal in the castings. The suggested gates to the castings are ¼-in. wide and 5/16-in. high, but you will have to experiment to determine the proper size. Sprue can be ⅞ or 1 in. in diam, tapered to ½-in. diam at the bottom.

It is suggested that a circular chamber about 1¼ in. in diam and ⅝-in. high be used in the drag at the end of the runner where the gate enters to help reduce the velocity of the metal stream. Preferably the other end of the runner should extend a few inches beyond the gates entering the last castings.

Using Olivine as Mold Medium

QUESTION Can you give us some information on olivine as a sand for making aluminum alloy castings? What are the advantages and disadvantages of its use in the foundry? What are the comparative costs of olivine and silica sands. For a small shop with two molders and little movement of sand, is it advisable to consider using olivine sand in preference to silica sand as far as health hazard is concerned?

ANSWER Several research articles on foundry application of olivine have appeared in the last few years. They include:

"Olivine Sand Research" by Schaller and Snyder, FOUNDRY, May, 1951.

"Casting Surfaces Produced in Olivine Molding Sand" by Schaller and Nelson, FOUNDRY, October, 1951.

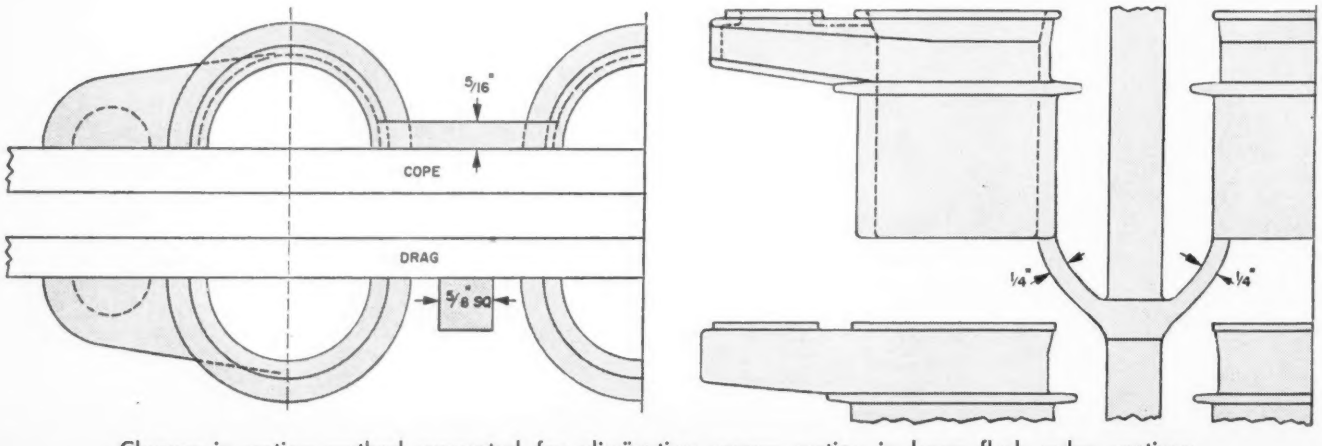
"Olivine Application in the Foundry" by Schaller, *Transactions*, American Foundrymen's Society, Vol. 60, 1952.

"Olivine-Silica Molding Sand" by Schaller and Snyder, *Transactions*, American Foundrymen's Society, Vol. 62, 1954.

Olivine is a greenish orthosilicate of iron and magnesium. It is found in large quantities in British Columbia, California, North Carolina, and in Norway. Olivine is being used in Norway, but to what extent, we do not know. It is angular grained in contrast to round grains of silica sand. It weighs about 122 lb per cu ft while silica sand weighs 98.5 lb. Expansion at 2000° F for olivine is 0.0137-in. per in., compared with 0.021-in. per in. for silica sand, and it is claimed that the lower expansion tends to minimize such sand defects as rattails and scabs, although it does not eliminate them.

According to the previously mentioned articles, olivine can be used for production of aluminum alloy castings as well as ferrous castings provided the grain fineness is suitable. However, it appears that its advantage of containing no free silica applies primarily to the ferrous field where the high pouring temperatures dry the sand considerably. The dried sand creates a dust problem in handling castings to which it adheres.

This does not mean that nonferrous foundries are free from dust, but dust generation is considerably lower than in the case of ferrous foundries. While we have no definite data, we believe that the dust problem in aluminum foundries is less serious than in brass and bronze foundries, because the considerably lower pouring temperatures of the former re-



Change in gating method suggested for eliminating porous section in brass flush valve castings

sult in less drying of the sand.

In modern, progressive foundries the dust problem has been minimized greatly by installation of exhaust and ventilating equipment where the dust originates—at shakeouts, sand conditioning or preparation equipment, etc.—and by use of respirators by operators at such points.

For your own operation, it appears that you will have to rely on silica sand. If you believe you have a dust problem, the hazard could be held to a minimum, if not eliminated, by having the operators wear respirators at the appropriate times.

Coating for Permanent Molds

QUESTION Several years ago in the Question and Answer section we remember reading of a mold coat used for spraying permanent molds. Our recollection is that the components included zircon flour, pink talc, sodium silicate, water, and possibly other materials. It also required that the solution be held at the boiling temperature for several minutes after mixing. We will appreciate more information on this mold coat or any other that you could recommend that would be better suited for our application. Our present material has a tendency to chip or flake when a heavy coating is applied. We are using process-iron molds and No. 356 aluminum alloy.

ANSWER While we do not recall the specific combination of materials you mention as constituting a mold coating, in the past almost every operator of a permanent mold shop had a pet and secret mold coating formula which supposedly surpassed all others. However, we believe at present the majority use any of the numerous proprietary materials which are available on the market. While the primary function of a mold coating is protection of the mold face, it also may aid in changing the chilling effect of the metal mold, prevent adhesion of metal to the mold and aid in removal of the casting, etc.

As might be expected, a wide variety of materials and combinations of them are employed as mold coatings. They include clay, whiting, talc, rouge, graphite, "red mud" (a byproduct obtained in refining of bauxite, sometimes called insulating powder), with or without addition of a small amount of sodium silicate as a suspension agent. One mixture said to give satisfactory results is made by heating to boiling 1 gal of water, and while boiling 12 oz 40 per cent sodium silicate (water glass), 10 oz whiting and 1 oz graphite or rouge are added and stirred in well. Solution is allowed to cool before use, and always should be well stirred to insure that the solid components are in suspension.

Possibly your trouble with the mold coating chipping or flaking arises from the method of application rather than the material. In applying coatings to molds, all the old coating should be removed by wire brushing or light abrasive blasting. Molds should be heated to around the operating temperature, and then a light coating sprayed on. This is rubbed down with steel wool; a second coat is applied and rubbed down, and then the final coat is sprayed on. If only two coats are needed the second is not rubbed down.

Where heavy coats are required such as on gates and runners, the material is brushed on thinly until the desired thickness is built up. As this description indicates, application of several thin coats always is preferable to one thick one since better adherence is obtained. A properly applied coating should serve through an operating shift with perhaps minor touch ups.

Definition of a Follow Board

QUESTION Can you help us find out what the term "follow board" means? In making some inquiries we have been told that it is an American term used for what is called an "oddside" in England, which may or may not be true.

ANSWER It is our impression that the British foundryman, like his counterpart in this country, often has the tendency to apply one word or term to several different things. From that point of view, the oddside and the follow board are brothers under the skin. If one wants to be stuffy and technical, however, there is a difference.

Actually the oddside made in green sand is a "false" cope which ordinarily is destroyed after the drag mold is made, but of course can be used for several drags if care is exercised in handling. However, it appears the term "oddside" also applies when, instead of green sand, a more permanent type of material—such as gypsum or, more commonly, "hard" sand formed of sand, litharge and linseed oil—is used. This practice permits repetitive use as well as storage for future use.

The term "oddside" also seems to be used to indicate a "turn-over" board—a wood board or form cut out or shaped to receive the cope side of the pattern and to generate the joint or parting line. The terms "turn-over board" and "follow board" are synonymous; generally these boards are used with patterns where the parting or joint is flat. In operation, the follow board with the pattern in place is used for making the drag. The whole assembly is rolled over, and the follow board removed, leaving the pattern in the drag mold. The cope mold is made on the drag and lifted off. The pattern is taken from the drag mold, replaced in the follow board, and the cycle continued.

As in the case of the word "oddside," the term "follow board" often is used on this side to designate hard sand matches and false copes.

Production of Bronze Letters

QUESTION We make plumber's brass from 100 per cent scrap, but recently obtained a contract for making bronze letters for installation on buildings which calls for use of statuary bronze and a dull finish. Can you tell us the composition of statuary bronze, and what is meant by the dull finish?

ANSWER While the term "statuary bronze" is commonly used, and appears to imply a specific composition, the actual fact is that the term is generic rather than specific, and a wide variety of compositions is employed for statuary.

This fact holds true even in "old" statuary, as indicated by the following works of art:

Statue of Napoleon I was made of an alloy containing 75 per cent Cu, 3 per cent Sn, 20 per cent Zn, and 2 per cent Pb; one of the Augsburg statues showed 94.74 per cent Cu, 1.64 per cent Sn, 0.54 per cent Zn, 6.24 per cent Pb, and 0.71 per cent Ni; Column Vendome shows 89.2 per cent Cu, 10.2 per cent Sn, 0.5 per cent Zn, and 0.1 per cent Pb.

Years ago Vickers pointed out that tin bronze is not fluid enough, and brass lacks hardness as well as the desired patina or color. Most suitable composition, according to him, is an intermediate between the two classifications. It contains a Zn content of 10 to 18 per cent and 2 to 4 per cent Sn. From that information you can see that a choice in composition is available, and it might be wise to

make up a few samples of different alloys for the customer to make a selection.

Dull color we assume to be a reference to the patina or color which develops naturally on long exposure of copper-base alloys to the atmosphere; mostly it is applied artificially. Such patina or color is developed by use of ammonium polysulphide solution which produces a range from light brown to black, and depends upon the amount of sulphide in the solution, immersion period, temperature of the solution, amount of scratch brushing, etc. Solution usually is made up with 2 oz commercial ammonium polysulphide per gallon of water. Before coloring, castings should be cleaned by immersion in an alkaline bath and rinsed thoroughly in hot running water. Then they are immersed in the polysulphide bath for a few seconds and examined for color. If not deep enough, immersion is repeated until the desired color is obtained. Castings are rinsed in running water, dried in sawdust, scratch brushed dry, and then coated with lacquer.

Bottled Gas as Furnace Fuel

QUESTION Since we propose to build a small foundry to produce both iron and nonferrous castings, we were interested in C. W. Ammen's article "Melting Iron in a Crucible" in the December, 1955 issue which mentioned use of gas as the fuel. As we do not have natural gas available in this area, we would like to know if bottled gas could be used. Also what type of furnace would be best for our purpose?

ANSWER While bottled gas or liquid petroleum gas is employed industrially for a variety of heating applications, we do not recall that it includes firing of crucible furnaces. However, we can see no reason why it could not be used for that purpose if the cost is competitive with fuel oil, for example, which commonly is employed in firing crucible furnaces.

For example, some information shows the theoretical available heat supplied by combustion of heavy fuel oil (152,000 Btu per gal) with exit gases at 2100°F to be 73,000 Btu per gal. Light fuel oil (138,000 Btu per gal) under the same conditions shows available heat of 70,000 Btu per gal. Commercial propane (276,490 Btu per gal) under the same temperature of exit gases shows 132,410 Btu per gal. With fuel oil at 8 cents a gallon, the liquid petroleum gas would be competitive with the heavy type when it could be purchased at 14.51 cents a gallon, and with the light fuel oil when the price is 15.14 cents a gallon.

It should be pointed out that the foregoing calculations will not necessarily hold in practice since they are based on perfect combustion conditions, and are used only to form a basis of comparison. Exact relationship between the fuels could be secured only by actual melting operations with the same or similar furnaces, crucibles, amount of metal, etc. Check with the furnace manufacturers for information on this subject, at the same time giving them some indication on how much metal you expect to handle in a day.

Shrinkage Charts Available

QUESTION Have you published a shrinkage conversion chart for converting various shrink dimensions to micrometer readings? If not, have you any idea where such a chart or charts might be obtained?

ANSWER While we have not published any charts converting fractional shrink measurements into decimal counterparts, we know that they are available. Probably your supplier of patternmaking equipment and supplies would have them or be able to secure the charts for you.

Desires Information on Sands

QUESTION We have been making a few aluminum alloy patterns for our own use using No. 1 Albany sand. It occurs to us that with a better sand to produce a more satisfactory finish, we could produce all of our patterns. Would addition of finer Albany or Winsdor Locks sand to the No. 1 Albany give the desired results? Also what aluminum alloy serves best for pattern use? Additionally can you suggest a good sand mix for dry-sand work for large cast iron gate valve bodies? We are using without too much success a mixture of 300 lb new sand, 600 lb heap sand, and 6 qt wheat flour which is tempered to 6 per cent moisture with half lignin or sulphite pitch and half water.

ANSWER While addition of fine sand to a coarse one will tend to produce a smoother surface on the casting, it usually takes a considerable amount to make an appreciable change. Therefore, it is more practical to purchase a sand with the desired fineness and other properties than to try to make changes by sand additions. As you know, the finer the sand, the smoother the surface on the castings, but as fineness increases the permeability decreases and blowing tendency increases. As a result, one has to compromise with a sand which will produce the smoothest surface without blows.

A number of aluminum alloys are being used satisfactorily for patterns. They vary slightly in copper and silicon content. One is A 108 with 4.5 per cent Cu and 5.5 per cent Si. Alloy 319 contains 3.5 per cent Cu and 6.3 per cent Si, while ASTM alloy SC64B contains 3.8 per cent Cu and 6.3 per cent Si. Some years ago a prominent patternmaker claimed that best results were secured with an alloy containing 5 per cent Cu and 3 per cent Si.

You do not mention what difficulties you are having with your dry sand mixture so no suggestions can be made on remedies, but you might try either of the following which have been recommended: One is composed of 60 parts by weight of old sand, 20 parts new sand of 55 to 60 grain size, 20 parts bank sand of 90 to 130 grain size, 3 parts western bentonite, 3 parts fireclay, 2 parts pitch and 7 per cent moisture. Another contains 200 lb old sand, 160 lb lake sand of 50 to 60 grain size, 6 lb fireclay, 6 lb western bentonite, 1 lb southern bentonite, 6 lb pitch, and 6 per cent moisture.

Customer Maintains Patterns

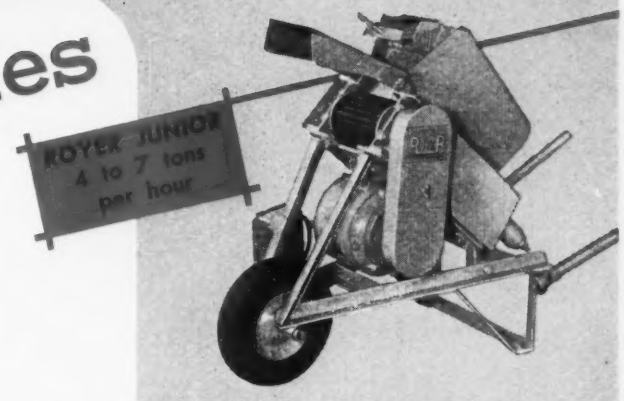
QUESTION Our firm is purchasing some gray iron castings from outside foundries and we would like to know whether or not it is common practice in the industry for the maintenance or repair of pattern equipment to be charged to the owner or to the foundry doing the work.

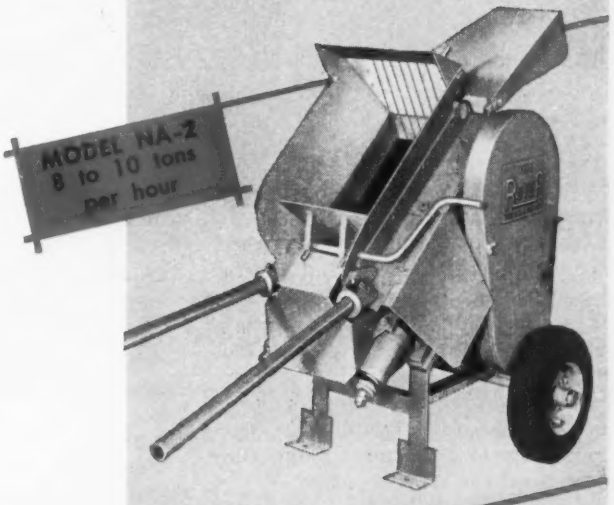
ANSWER Usual practice in the gray iron foundry industry is to charge the customer for repair and maintenance of pattern equipment. This practice is specifically indicated in "Terms and Conditions of Sale of the Gray Iron Foundry Industry" prepared by the Gray Iron Founders' Society and approved by the National Association of Purchasing Agents. Item 19 of these terms states, "Repairs and changes to patterns by customer's orders will be made at the expense of customer." Along somewhat the same line, item 14 states, "Customer must supply pattern and corebox equipment in condition to produce economically the quality and quantity of castings required."

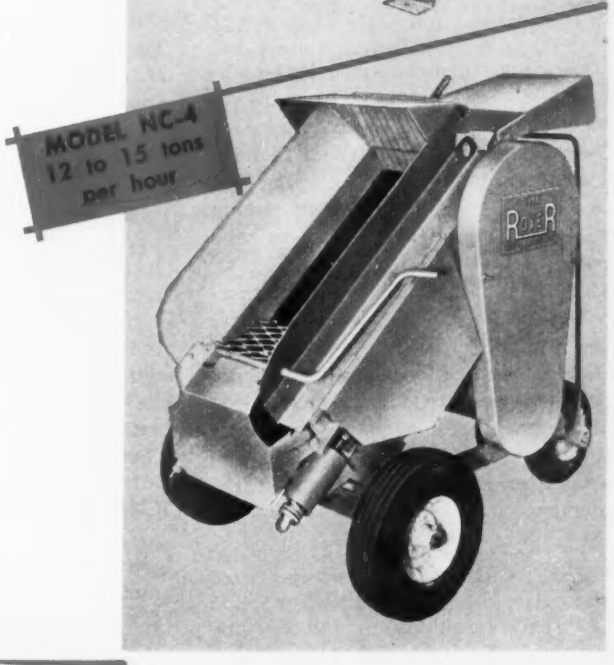
Terms and conditions of sale as prepared by the Non-Ferrous Founders' Society and approved by the National Association of Purchasing Agents include this statement: "All repairs and changes necessary to place equipment (pattern and corebox) in proper condition shall be the purchaser's obligation."

PROPERLY PREPARED SAND

for Small Foundries Core Rooms Side Floors







There is a Royer Sand Separator and Blender to provide fast, efficient sand preparation in tonnages suitable for small foundries, core rooms and side floors in production shops. Operations having comparatively low sand requirements gain the same advantages from the use of a Royer as do larger operations without the necessity of investing in costly equipment built for greater capacities.

With the Royer specifically designed for your needs . . . regardless of the type of sand used . . . whether you pour grey iron, malleable, steel, semi-steel or non-ferrous, you will

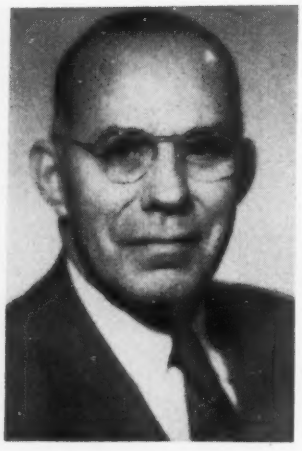
1. Cut labor costs
2. Reduce requirements for facing sand
3. Save on costs for new sand
4. Reduce blows, drops, runouts and rough surfaces
5. Cut discount losses
6. Practically eliminate riddling time
7. Greatly reduce cleaning room costs
8. Cool your sand

Over 8000 Royers are in use in foundries all over the world. More than one-half of the Royer users have bought additional units—certain testimonial to their profitable operation. Send for bulletin giving complete information on the sizes and models available.

Foremost in Sand ROYER *Conditioning Equipment*

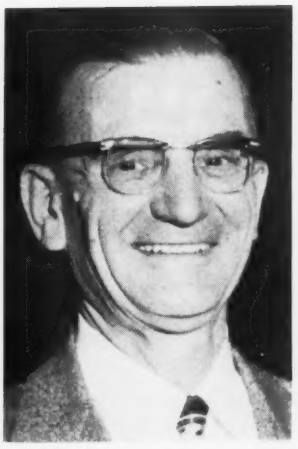
ROYER FOUNDRY & MACHINE CO. 159 PRINGLE ST. KINGSTON, PA.

MEN . . . of industry



EUGENE H. WEAK
. . . electric furnace consultant

HENRY J. HERBRUGGEN
. . . engineering-design mgr.



MARTIN A. HARDER
. . . retires, Lakeside Malleable

ROBERT C. WAYNE
. . . joins Hamilton Foundry

EUGENE H. WEAK, former electric furnace superintendent at the Indiana Harbor Works, American Steel Foundries, East Chicago, Ind., retired recently. Mr. Weak is now acting as a consultant on electric furnace practice, with headquarters at 2933 Highway Ave., Highland, Ind. Prior to joining American Steel Foundries he was associated with Allis-Chalmers Mfg. Co., Cincinnati, and Alloy Cast Steel Co., Marion, O.

Ernest E. Harkess, since 1951 manager of the pattern department, Cleveland Foundry, Ford Motor Co., Dearborn, Mich., was named foundry production manager, succeeding the late C. E. Barnett. Prior to joining Cleveland Foundry in 1950 he was associated with Buick Motor Division, Flint, Mich. **C. E. Goodman,** formerly supervisor of the pattern process and design section, has succeeded Mr. Harkess as head of the pattern department. Mr. Goodman became a production equipment designer for the Cleveland Foundry in 1950 and was later section supervisor in the foundry.

Earl W. Beyerlein was appointed supervisor, Foundry Division, Eaton Mfg. Co., Vassar, Mich. He was formerly casting buyer, Cleveland Axle Division and Marion, O., Forge Division, for the company, with headquarters in the Cleveland home office. Before joining Eaton, Mr. Beyerlein was associated with J. I. Case Co., Racine, Wis., and Koppers Co., Pittsburgh.

Henry J. Herbruggen was named manager of engineering and design, San-Blo Division, Federal Foundry Supply Co., Cleveland. Born and educated in Germany, he designed automatic core and mold blowing equipment there before coming to this country in 1949, when he joined Federal Foundry. **Vincent Janis Jr.** was appointed chief engineer of the division. He was formerly supervisor, Central Foundry Division, General Motors Corp., Danville, Ill. **Robert H. Burnell,** with Federal since 1934, was appointed production manager of the company's bentonite operations in Chicago.

Martin A. Harder, for 26 years plant superintendent, Lakeside Malleable Castings Co., Racine, Wis., retired recently and will live in Phoenix, Ariz. During 50 years in the foundry industry Mr. Harder was associated with Chain Belt Co., South Side Malleable Foundry and Wisconsin Malleable Foundry, all of Milwaukee, and General Motors Corp. in Saginaw, Mich. He joined Lakeside Malleable Castings in 1929.

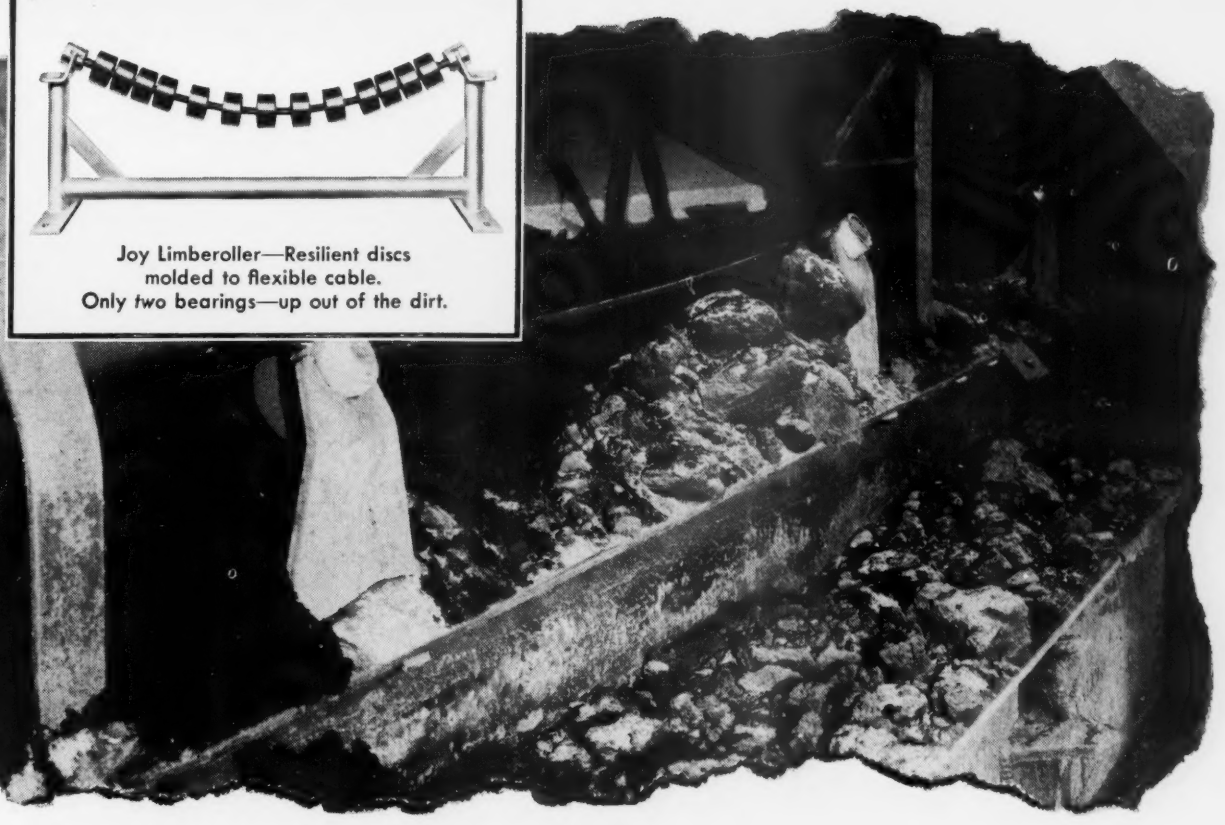
Emil G. Holmberg, for 9 years chief metallurgist, Alloy Steel Products Co., Linden, N. J., has joined the corrosion engineering section, Development and Research Division, International Nickel Co., New York. A graduate of Colorado School of Mines, he was associated previously with E. I. du Pont de Nemours & Co., Wilmington, Del., as metallurgist at the Huntington, W. Va., plant.

Robert C. Wayne, for the last 7 years advertising-sales promotion manager, Industrial Divisions, Surface Combustion Corp., Toledo, O., was appointed sales manager, Hamilton Foundry & Machine Co., Hamilton, O. A graduate of Rensselaer Polytechnic Institute, Mr. Wayne was previously associated with Babcock & Wilcox Co., Barberton, O., Steel Founders' Society of America, Cleveland, and Naval Research Laboratory, Washington.

Charles W. McLennan was named general manager, Lynchburg Foundry Co., Lynchburg, Va., succeeding **Lloyd C. McNeill,** who resigned recently. Mr. McLennan attended Virginia Polytechnic Institute and joined Lynchburg Foundry in 1933. In 1954 he was named vice president, a position he will continue to hold. **H. R. Fisher** has joined the company as a senior metallurgist in the research department. He is a graduate of South Dakota School of Mines.

Albert C. Hubbard was appointed foundry manager, Elsner-Fitz Foundry Inc., Hanover, Pa. Previously he was foundry superintendent, Three Rivers Casting Corp., Three Rivers, Mich., and superintendent, Wiard Plow Co., Batavia, N. Y.

E. Kendrick Leavenworth has been transferred to the technical processes and economic engineering staff, Climax Molybdenum Co., with headquarters in the New York home office. A graduate of Yale University,



Joy Limberoller—Resilient discs molded to flexible cable. Only *two* bearings—up out of the dirt.

IN THIS FOUNDRY'S SAND CONVEYOR, JOY IDLERS LAST *TWELVE* TIMES LONGER

THREE YEARS IN SERVICE Joy Limberollers . . . unique, 2-bearing, suspension idlers for belt conveyors . . . have successfully operated in a Midwestern magnesium foundry since February, 1953. They are still going strong after giving twelve times the three-month life of conventional idlers.

SUPPORT 30"/30' BELT The Limberollers were installed on a conveyor belt which carries molding sand from a chute, up a 35° inclined plane, to a transverse belt.

NO BEARING FOULING The bearings are up out of the sand, unaffected by spillage. Fouled bearings, which stop the idler roll and cause damage to the belt, are no longer a problem.

EASY MAINTENANCE There are only two bearings on each idler . . . and that makes the maintenance men happy. They also like the ease with which the Limberoller can be removed . . . without stopping material flow . . . if and when maintenance becomes necessary.

MANAGEMENT HAPPY Such satisfactory service is welcomed by the foundry management. You will be pleased, too, when you discover how the Limberoller can increase efficiency of your belt conveyor operation. For details, see your Joy representative, or write to ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada. *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Write for FREE Bulletin 62-13

Consult a Joy Engineer

about

LIMBEROLLER

THE IDLER WITH FLEX APPEAL

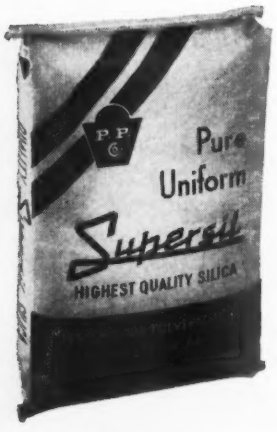
WSW 15503-62

JOY

SINCE 1851—OVER 100 YEARS OF ENGINEERING LEADERSHIP

Put a superfine finish on YOUR castings

with Supersil Silica Flour



In your mold wash, Supersil always gives the same even coating and thickness of application. Its high fusion point and excellent refractoriness help you to reduce metal penetration, minimize surface defects and produce castings with super-smooth finish.

Added to your molding sand, Supersil increases dry and hot strengths as well as sand toughness. Your sand mixture is more workable and will hold dimension better. Moreover, the ability of the mold to maintain its shape at pouring temperatures is increased with Supersil. The exceptionally high fusion point of Supersil increases the overall sintering point and fusion point of the sand mixture.

Unequalled quality (99.9% SiO_2) and perfect uniformity, shipment after shipment, make Supersil the best Silica Flour for you. To obtain further information and free working samples, contact **Pennsylvania Pulverizing Company, Two Gateway Center, Pittsburgh, Pa.**

P.G.S. Corp

Pennsylvania Glass Sand

P. P. Co.

Pennsylvania Pulverizing

The Nation's Leading Producers of Pure Crystalline Silica

BERKELEY SPRINGS, W. VA. · MAPLETON, PA. · McVEYTOWN, PA. · NEWPORT, N. J. · KLONDIKE, MO. · MILL CREEK, OKLA.

For more information, use Reader Service Card, page 201

HARRY R. DAHLBERG
. . . joins Braden Copper Co.

ALOYSIUS M. TULLO
. . . v. p., Worthington Corp.

ELSTON J. TRIBBLE
. . . Worthington Corp. v. p.

LESLIE L. SHAFER
. . . assistant sales mgr.

Mr. Leavenworth since 1943 was at the company's research laboratory in Detroit, where he held various supervisory positions.

Harry R. Dahlberg, formerly foundry engineer, E. W. Bliss Co., Hastings, Mich., has joined Braden Copper Co., Rancaguac, Chile, S. A., where he will supervise its iron, steel and brass foundry operations.

Loren C. Hurd, since 1947 technical director of the export department, Rohm & Haas Co., Philadelphia, was appointed president and a director, Metals Disintegrating Co., Elizabeth, N. J., succeeding the late Harold E. Hall. Mr. Hurd was graduated from Carleton College and received his master's and doctor of philosophy degrees from University of Wisconsin. **D. C. Bradley,** for the past year assistant to the president in charge of various plant operations, was appointed general manager of the pulverizing machinery division, in Summit, N. J.

Ralph E. Fritzsche and **George J. Lawson** have been appointed district application engineers, Clark Controller Co., Cleveland. Mr. Fritzsche, who will serve in the Youngstown, O., office, was previously in personnel and safety work and as plant engineer with the company. Mr. Lawson was formerly associated with United States Steel Corp., Pittsburgh.

Alfred F. Bauer was appointed assistant general manager, Doehler-Jarvis Division, National Lead Co., New York. Formerly chief engineer of the division, he will also continue in that capacity. Mr. Bauer joined the division's research staff in Toledo, O., in 1951, after 3 years with Dow Chemical Co., Midland, Mich.

Elston J. Tribble and **Aloysius M. Tullo** were elected vice presidents, Worthington Corp., New York. Mr. Tribble joined the company in 1929, became production manager in 1935 and works manager of the Harrison, N. J., plant in 1945. He was named assistant vice president in 1954. Mr. Tullo, with Worthington since 1923, was appointed manager of the Wellsville, N. Y., works in 1945 and manager of the Harrison works in 1954. He will continue as general manager of the Harrison Division, a position he has held for the past year.

N. Harold Boardman was appointed manager-manufacturing and employee and plant community relations at the Elmira, N. Y., works, General Electric Co., Schenectady, N. Y., succeeding **Ralph H. Roberts,** who will assist in a long-range study for the foundry department. Mr. Boardman, a graduate of Syracuse University, joined Elmira Foundry Co. in 1917, and since 1948, when the plant became one of the G-E foundries, he was assistant manager and superintendent of manufacturing. **Charles G. Lauckner III** was named manager-manufacturing engineering in Elmira. Mr. Lauckner attended Northeastern University and joined the company in 1935. After engineering positions at the Lynn River, Mass., and Everett, Mass., plants, in 1953 he became facilities engineer for the entire foundry department. **E. Raymond Filosi** succeeds Mr. Lauckner in that position. A graduate of Massachusetts Institute of Technology, Mr. Filosi became supervisor of methods and engineering planning for the Lynn and Everett foundries, after assignments at the Lynn River plant. For the past year he was in Schenectady, engaged in a study of the foundry department's facilities.

Leslie L. Shafer, formerly personnel director of the Defiance, O., plant, Central Foundry Division, General Motors Corp., was appointed assistant sales manager at the division's Saginaw, Mich., plant. A graduate of Occidental College, he was previously associated with Packard Electric Division, GMC, Warren, O.

David T. Martin for 3 years sales manager, Central Foundry Division, General Motors Corp., Saginaw, Mich., was appointed director of quality control. Mr. Martin joined GMC in 1935, working at Fisher Body Plant, Flint, Mich., and Saginaw Steering Gear Division until 1944 when he entered the Central Foundry Division's sales department.

Maurice H. McKinnon was appointed plant manager, Perfect Circle Corp., Hagerstown, Ind. Associated with the plant since 1939, he was department foreman, process engineer, general foreman and served as production superintendent last year.

Daniel B. McDyre, formerly melting foreman, Dodge Steel Co., Philadelphia, was named superintendent, succeeding **Gustave F. Ebeling,** retired. Mr. McDyre joined the company in 1938.

Ned Woolums was appointed vice president of the manufacturing division, Parker Sweeper Co., Springfield, O. **Paul R. Reaver** has succeeded him as plant superintendent of the division.

James Suttie, since 1943 vice president, American Steel Foundries, Chicago, has retired folowing 44 years of service. Starting in the order department he rose to positions of increasing responsibility, be-

6,000 lb. series charging conveyor machine

THE HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.

L OF SAND

Show most foundrymen a new machine and sooner or later they pop up with, "Yes, but does it work if you heave a shovelful of sand on it?"

Usually there is a lot of experience and common sense behind the question. And alert executives realize the same sort of down to earth yardstick must be applied in the planning department.

They know it is possible to throw "sand" on technical progress and physical growth.

How? By limping along with outmoded methods ("That's the way we've always done it"); by sticking to antiquated machinery ("It's still running"); by buying cost instead of quality ("Our budget won't stand it").

Modern foundries have come to depend on Herman Molding Machines. One large Canadian foundry, for example, produces both round and square boiler sections — at a rate of 220 half molds in each 8-hour molding shift — on an installation of Herman charging conveyor type machines. Like all Herman units, these 6000 lb. series machines are constructed for durability, designed to meet changing conditions.

Write for further information now.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

HERMAN

Best Known Name in Molding Machines

coming manager of the Indiana Harbor Works in 1929. On various occasions he headed industry advisory committees for the government.

Willis G. Scholl, Allis - Chalmers Mfg. Co. vice president in charge of the Tractor Division, was elected executive vice president. He started with the company's sales department in 1936. **Boyd S. Oberlink,** for the past year vice president-general manager of the Construction Machinery Division, succeeds Mr. Scholl as group executive.

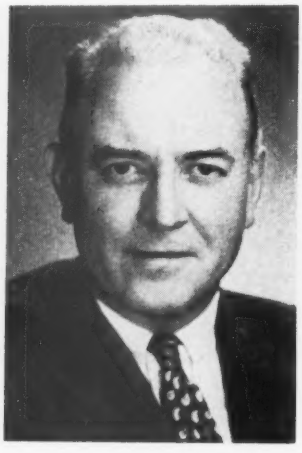
W. E. Viggers, until recently associated with Penn Steel Casting Co., Chester, Pa., was appointed New York district sales manager for manganese and alloy steel castings, Taylor-Wharton Division, Harrison Steel Corp., High Bridge, N. J.

A. N. McFarlane was elected vice president-general sales manager, Corn Products Refining Co., New York. With the company since 1934, he was assistant to the general sales manager for the past 8 years. Mr. McFarlane is a vice president of Corn Products Sales Co.

rence, executive vice president, has succeeded Mr. Morrow as president and chief executive officer. **W. L. Wearly** was named executive vice president. **H. C. Nyquist** has succeeded Mr. Wearly as vice president-general sales.

Jack C. Lucas was elected executive vice president, Ross-Meehan Foundries, Chattanooga, Tenn. Other officers remain the same. Originally associated with Bucyrus-Erie Co., Erie, Pa., Mr. Lucas since 1944 was consultant for Meehanite Metal Corp., New Rochelle, N. Y.

CHARLES O. MORRIS
. . . becomes assistant mgr.



A. N. McFARLANE
. . . Corn Products sales v. p.

ELMER B. DUNKAK
. . . Selas Corp. v. p.

H. GENE MILLER
. . . Bay State Abrasive sales

Charles O. Morris was appointed assistant manager, pig iron sales, American Steel & Wire Division, U. S. Steel Corp., Cleveland. After graduation from Bucknell University, Mr. Morris joined the Duquesne, Pa., works of U. S. Steel in 1937 and was transfered in 1944 to sales work in its Pittsburgh office. He became assistant manager of commercial research for American Steel & Wire in 1948 and in 1953 was assigned to pig iron sales in Indiana and Michigan.

John R. Hewitt was appointed Boston district sales manager, Harbison-Walker Refractories Co., Pittsburgh. A graduate of University of Pittsburgh, he joined the company in 1928 and has held various positions in the sales department, recently in the Philadelphia area.

John J. Valentine, formerly associated with Kolcast Industries Inc., Cleveland, was appointed director of engineering, Mercast Corp., La Verne, Calif.

C. R. Raforth, president-general manager, Neenah Brass Works Inc., Neenah, Wis., retired recently, after 30 years with the company.

Elmer B. Dunkak was appointed vice president-sales, Selas Corp. of America, Philadelphia. Mr. Dunkak was engaged in private engineering practice until 18 months ago when he joined Selas as consultant to the president. Previously he was associated with C. M. Kemp Mfg. Co., and Davison Chemical Corp., both of Baltimore.

Webb L. Kammerer, president, Midvale Mining & Mfg. Co., St. Louis, was given a lifetime appointment to the board of directors, Washington University of St. Louis. Mr. Kammerer is a graduate of the university's school of engineering. He served as chairman of the St. Louis Chapter of the AFS during 1953-54.

Warren A. Scott recently joined the sales staff of Brumley-Donaldson Co., Los Angeles. A graduate of Purdue University, Mr. Scott spent 7 years with Whiting Corp., as sales engineer in the Harvey, Ill., and Norwalk, Calif., district offices.

J. D. A. Morrow was named chairman of the board of directors, Joy Mfg. Co., Pittsburgh, after serving as president for 15 years. **John Law-**

H. Gene Miller was appointed abrasive engineer in Minnesota and part of Wisconsin, Bay State Abrasive Products Co., Westboro, Mass. Until recently he was an abrasive specialist with Bossert Co. in Kansas City, Mo.

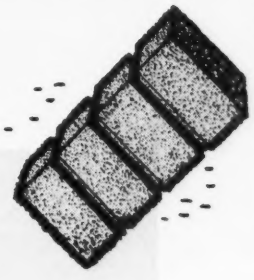
Dr. John D. Leitch was named vice president-engineering, Square D Co., Detroit, with headquarters in the executive offices there. **Alvin C. Dyer** was appointed vice president-general manager, Electric Controller & Mfg. Co., Cleveland, now a division of Square D Co. Dr. Leitch was graduated from University of Glasgow, Scotland, and University of Toronto, Canada. He joined Electric Controller in 1937, became chief engineer in 1943 and a vice president in 1952. Mr. Dyer, a graduate of Carnegie Institute of Technology, joined Electric Controller in 1913 as a salesman and successively became a district manager and general sales manager. He was vice president-sales since 1943.

Arthur E. A. Mueller was named chairman of the board, Sterling Casting Corp., Bluffton, Ind. **James Alex**

Foundries can count on

Famous CORNELL CUPOLA FLUX

To: Purge impurities in molten iron. Make it more fluid. Produce cleaner castings, cut rejects to a minimum. Reduce digging out time.



The Benefits . . .
The Advantages of
Famous CORNELL
Aluminum and Brass Flux

Makes metal pure and clean.
Permits use of more scrap without danger of dirt, porous places or spongy spots due to dirty metal.
Thinner, yet stronger sections can be poured.
Metal does not cling to the dross as readily.
Crucible or furnace linings are kept clean.
Cleanses molten brass even when the dirtiest brass turnings or sweepings are used.
Saves considerable tin and other metals.
Forms a perfect covering over the metal during melting, prevents oxidation and reduces obnoxious gases to a great extent.

Write for Bulletin 46-A

Why do so many foundries make it "standard operating procedure" to use Famous Cornell Cupola Flux? The answer must be in the advantages gained through the constant use of this scientifically-designed mixture of high-grade fluorspar and other materials. Some of these advantages are: increase in the amount of slag that floats and flows off, sulphur greatly reduced, cleaner castings and rejects cut to a minimum.

Without obligation on your part, we will send an experienced Cornell Flux engineer to your foundry to discuss how you can improve the quality of your gray iron, brass and aluminum castings.

Why not call today or send for Bulletin 46-B.

The CLEVELAND FLUX Company
1026-40 MAIN AVENUE, N. W. • CLEVELAND 13, OHIO
Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

FAMOUS CORNELL FLUXES
Trade Mark Registered

has become president-general manager. Other officers elected recently are **Arthur J. Mueller,** vice president, and **Werner Christensen,** secretary-treasurer.

Dr. John C. McDonald, assistant technical director of the magnesium department and head of the metallurgical laboratory, Dow Chemical Co., Midland, Mich., will devote full time as assistant technical director and has been made a member of the magnesium administrative and planning group. **Dr. Robert S. Busk** has succeeded Dr. McDonald as head of the laboratory. **Harold A. Robinson,** chief of the laboratory's chemical section, has been made assistant head of the laboratory.

Robert C. McDowell was elected president, Wellman Engineering Co., Cleveland, succeeding **Dr. J. C. Hodge,** who has resigned as president and a director. Mr. McDowell, president of McDowell Co., Cleveland, has been chairman of the board of Wellman Engineering since 1954 and will continue in that capacity.

Philip A. Mulvey Jr. was appointed field representative, Republic Rubber Division, Lee Rubber & Tire Corp., Youngstown, O., with headquarters in the Chicago office, where he will handle the territory formerly covered by **I. G. Wollter,** recently named Chicago district manager.

William B. Ilko was appointed administrative assistant to the vice president-director of sales, American Chain & Cable Co., New York. For many years Mr. Ilko was associated with Simonds Abrasive Co., Philadelphia, division of Simonds Saw & Steel Co., Fitchburg, Mass., where since 1937 he was general sales manager.

August T. Murray, Oliver P. Quist and **William J. Reid** have been appointed sales managers for the Coated Abrasives Division, Carborundum Co., Niagara Falls, N. Y. Mr. Murray, with headquarters in Niagara Falls, will manage the Buffalo and Pittsburgh areas. Mr. Quist, manager of the New England and New York districts, will be located in West Springfield, Mass. Mr. Reid, Midwestern district manager, will have headquarters in Chicago. **R. Stanley Burt, Edward J. Schultz, Robert A. Murphy,** and **Joseph M. Morin** have been appointed abrasive grain specialists for the Electro Minerals Division. Mr. Burt will cover metropolitan Chicago and parts of Wisconsin, Illinois and Iowa. Mr. Schultz will service the Michigan and Toledo, O., area. Mr. Murphy will have the New England area and Mr. Morin will cover metropolitan New York and the New Jersey area.

Francis A. Diel, for the past year district sales manager, Chain Division, Republic Steel Corp., Cleveland, was appointed New York district sales manager, American Chain Division, American Chain & Cable Co., New York. Mr. Diel attended Cornell University and previously was associated with Columbus McKinnon Chain Co., North Tonawanda, N. Y., and Bridgeport Chain & Mfg. Co., Bridgeport, Conn.

William R. Moore, vice president, Norton Co., Worcester, Mass., recently retired after 42 years of service. He joined the company after graduating from Pennsylvania State College. He became general sales manager of the abrasive division in 1939 and in 1943 was named vice president in charge of national accounts including supervision of refractory product sales. He was made a director in 1948.

Herbert E. Barth was named executive vice president, American Blower Corp., Detroit. **Edwin W. Petersen** has succeeded Mr. Barth as vice president-sales. Mr. Barth joined the company in 1915 and became vice president-sales in 1937. Mr. Petersen started as a sales engineer in 1923 and became sales manager in 1952. **Clarence W. Johnson** was named president, and **Richard R. Noyes,** vice president-sales, Canadian Sirocco Co. Ltd., subsidiary of American Blower Corp.

J. W. MacKay, sales manager, American Cast Iron Pipe Co., Birmingham, was also named vice president and secretary. He joined the company in 1936. **James B. Hill,** since 1952 manager of the company's Kansas City, Mo., sales office, was appointed assistant sales manager of ACIPCO. He has spent 21 years with the company.

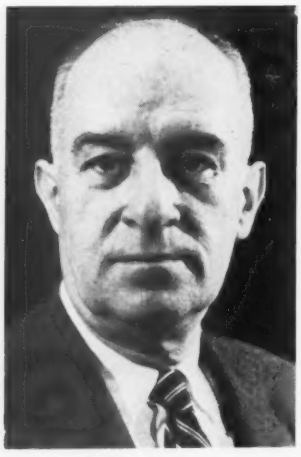
George W. Baillie Sr., vice president, Quaker City Foundry Inc., Salem, O., was elected president of the Industrial Information Institute, Youngstown, O., for the current year.

Frank K. Donnelly, for the past two years sales engineer, Trane Co., La Crosse, Wis., has been named sales representative, Torit Mfg. Co., St. Paul, in Washington and Oregon.

Kenneth A. Digney, president, Oberdorfer Foundries Inc., Syracuse, N. Y., was elected president of the Manufacturers' Association of Syracuse for the current year.

Robert Cushman was appointed assistant to the sales manager of grinding wheels, Norton Co., Worcester, Mass. A graduate of Dartmouth College, he joined the company in 1944

WILLIAM B. ILKO
. . . joins American Chain



FRANCIS A. DIEL
. . . N. Y. district mgr., ACCO

WILLIAM R. MOORE
. . . retires, Norton Co.

ROBERT CUSHMAN
. . . grinding wheel sales

- **G-32 FOR TEMPERATURES TO 3200° F.**
  The only insulating firebrick on the market designed for such high temperature service.
- **G-30 FOR TEMPERATURES TO 3000° F.**
  A 3000° F. insulating firebrick . . . precise data recorded in actual service proves it to be the outstanding brick of its type.
- **G-28 FOR TEMPERATURES TO 2800° F.**
  Can be used in place of normal fire-clay brick with tremendous savings in weight and fuel costs.
- **G-26 FOR TEMPERATURES TO 2600° F.**
  In many furnaces where the temperature does not exceed 2600° F., G-26 can be used in place of fire-clay brick.
- **G-23 FOR TEMPERATURES TO 2300° F.**
  Unexcelled for use in heat treating and annealing furnaces in which the temperature does not exceed 2300° F.
- **G-20 FOR TEMPERATURES TO 2000° F.**
  Designed primarily as a high temperature backing-up insulation, G-20 can also be used in direct contact with flame and furnace gases.

For additional information call your local A. P. Green distributor . . . he's listed in the yellow pages of your telephone directory, or write

A. P. Green REFRACTORY PRODUCTS

SERVE THE WORLD'S INDUSTRIES

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PLANTS: Mexico, Mo. • Woodbridge, N. J. • Sulphur Springs, Texas
In Canada: **A. P. GREEN FIRE BRICK COMPANY, LTD.**
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ONE DEPENDABLE SOURCE OF SUPPLY FOR A COMPLETE LINE OF INSULATING FIREBRICK TO 3200° F.

A. P. Green Fire Brick Company offers you one source of supply for insulating firebrick for all temperatures from 2000° F. to 3200° F. All A. P. Green insulating firebrick have high insulating value, structural strength and the ability to withstand high temperatures without shrinkage. They are ground to accurate dimensions after firing and are available, in stock, in all standard nine inch series shapes. Information on special shapes and sizes furnished on request.

• distributors in the principal cities of the world.

and served as an abrasive engineer in the Syracuse, N. Y., area for 7 years. **Harry G. Brustlin,** formerly an abrasive engineer in the Los Angeles area, has succeeded Mr. Cushman as West Coast district manager. **Donald F. Jones,** an abrasive engineer in the Syracuse, N. Y., area, was appointed Pittsburgh district manager, succeeding **Charles B. Price,** who retired recently.

H. K. Intemann was appointed executive vice president, Electro Metallurgical Co., division of Union Carbide & Carbon Corp., New York. Mr. Intemann is a graduate of Stevens Institute of Technology. In 1944 he became associated with Bakelite Co., also a division of Carbide, and since 1953 was vice president-general sales manager. **John D. Benedito** has assumed Mr. Intemann's former duties as general sales manager of Bakelite Co. He joined Carbide in 1935 following graduation from Yale University.

Harry D. Hunt was appointed project engineer, Industrial Engineering Department, Texas Foundries Inc., Lufkin, Tex. A graduate of Georgia Institute of Technology, Mr. Hunt took graduate work at General Motors Institute of Technology. Previous connections include Central Foundry Division, General Motors Corp., Saginaw, Mich., and Lockport, N. Y.; Auto Specialties Mfg. Co., St. Joseph, Mich.; Homer Foundry Co., Coldwater, Mich.; and Pettibone Mulliken Corp., Chicago.

John W. Vaughan was named assistant to the vice president, Alloy Metal Division, Alter Co., Davenport, Iowa. A graduate of Purdue University, Mr. Vaughan was formerly a district manager for *Steel* magazine.

Fred E. Solymos was named vice president - general sales manager, Colonial Metals Co., Columbia, Pa. Mr. Solymos has been associated with the nonferrous metals field for many years.

Dailey D. Sisler was appointed abrasive sales engineer, Sterling Grinding Wheel Co., Tiffin, O. With the company for several years, he will cover Tennessee, Mississippi, Alabama, eastern Louisiana, and western Georgia, with headquarters in Birmingham.

DAILEY D. SISLER
. . . grinding wheel sales

William N. Brammer was appointed eastern sales manager, Apex Smelting Co., Chicago, with headquarters in Cleveland. **George H. Starmann Jr.,** midwest sales manager, will be located in Chicago, and **John J. Stobie Jr.,** West coast sales manager, in Long Beach, Calif.

Wallace L. Turner, assistant sales manager, was named manager of foundry products sales, Home Equipment Division, Combustion Engineering Inc., Chattanooga, Tenn. He was in manufacturing operations of the company prior to joining the sales department.

Carl B. Stone was appointed zone manager, with headquarters in Plainfield, N. J., for Sorbo-Mat Process Engineering Inc., Clayton, Mo. For the past 8 years Mr. Stone was associated with Lynchburg Foundry Co., Lynchburg, Va. Previously he was with John Deere Tractor Co., Waterloo, Iowa, and Caterpillar Tractor Co., Peoria, Ill.

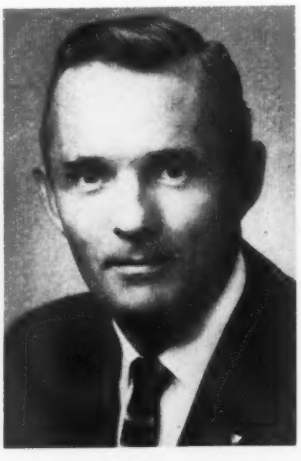
T. O. Weaver was appointed sales engineer in the Chicago area, and **Alexander J. Szabo** in the Detroit area, Pangborn Corp., Hagerstown, Md. They will specialize in application of abrasives and wear resistant plates for blast cleaning. **Paul P. Butler** will handle sales of the company's products in the Pittsburgh area.

Julian Grombacher has joined Luria Brothers & Co., Philadelphia, to handle sales of scrap in the Chicago area. Mr. Grombacher, who attended Illinois Institute of Technology, spent 3 years as a metallurgist production control engineer at the Gary, Ind., works of United States Steel Corp.

Wade Meloan was elected vice president, Pettibone Mulliken Corp., Chicago. **Lawrence E. Denman** has succeeded Mr. Meloan as treasurer.

M. J. Drackett was appointed sales manager of the attachments section, Industrial Truck Division, Clark Equipment Co., Battle Creek, Mich. For the past 7 years Mr. Drackett was a sales engineer with Modern Handling Equipment Inc., Clark's Chicago distributor.

JOHN W. VAUGHAN
. . . joins Alter Co.



WALLACE L. TURNER
. . . foundry products sales

M. J. DRACKETT
. . . joins Clark Equipment Co.

Wheelabrator® Swing Table

SAVES 15 MAN HOURS DAILY

at

W. A. Jones Foundry & Machine Co.

Chicago, Illinois

Savings effected through reduction in cleaning room manpower were sufficient to amortize within a short time the entire investment in a Wheelabrator Swing Table at W. A. Jones Foundry & Machine Co., Chicago.

A desire to produce finer finished gray iron castings at lower cost led this firm to improve its overworked cleaning room. Obsolete equipment with its resulting high labor requirements and low efficiency had to go. The five tumbling barrels and an airblast room required an operating force of 32 man hours daily. In spite of this cleaning crew, the cleaning department was unable to keep up with the pouring floor.

5 TUMBLING MILLS ELIMINATED

With the installation of the versatile Wheelabrator Swing Table this vexing problem was completely solved. Castings weighing up to two tons in weight and measuring up to 72" in diameter are cleaned in five minutes' time. Smaller work is grouped on the work table with the hard-hitting abrasive blast from the overhead Wheelabrator unit providing uniform speed cleaning of all surfaces.

As a result, all tumbling mills have been replaced.

AIRBLAST ROOM TIME SLASHED 88%

Whereas a large airblast room had previously been operated 8 hours daily, the use of this costly, time-consuming room now is limited to the cleaning of an occasional extremely large, heavy casting — about one hour daily.

FASTER, MORE EFFICIENT CLEANING

Cleaning operations are now on a production basis. The bottleneck of work awaiting cleaning has been broken. As a result, production has been speeded up, the cleaning capacity of the foundry has been increased and overall cleaning costs were drastically reduced. Only 17 man hours daily are now charged to the foundry cleaning room.

It's easy to "keep up with the Jones" in solving your cleaning problems with Wheelabrator airless blast cleaning. Standard and special design machines are available to meet every production requirement . . . to lower your costs . . . to improve the quality of your product . . . or to increase production. Write today for a copy of Catalog 74C.

WHEELABRATOR
CORPORATION
(Formerly American Wheelabrator & Equipment Corp.)

World's Largest Builders of Airless Blast Equipment

505 S. Byrkit Street, Mishawaka, Indiana

Electronic conductivity meter was used to check red brass castings for iron contamination at a rate of 500 per hour

A Rapid Method of

SORTING CONTAMINATED CASTINGS

By FRANK J. VERSAGI
Mueller Brass Co.
Port Huron, Mich.

AN ELECTRONIC conductivity meter was used recently to sort 10,000 red brass castings at the rate of 500 per hour. The individual sorting prevented the scrapping of thousands of good castings and prevented a large rerun in the foundry.

The castings, made of 85-5-5-5 metal, had passed from the foundry into the machine shop where tools and castings began to break.

A salt-water immersion test revealed the presence of free iron particles in some of the defective castings. The chips from other defective castings showed no free iron but exhibited magnetism, and chemical analysis indicated the iron in these castings to be on the order of 1.5 per cent. This, of course, indicated gross iron contamination in one or more of the heats used in preparing the 10,000 castings.

A nondestructive test was required to separate the good castings. Since the drillings from the contaminated castings showed magnetism, a check was made of the relative conductivities of the low-iron and high-iron castings. The acceptable brass castings, compared to a copper standard, exhibited conductivities between 16.5 and 17.5 per cent. The high iron castings exhibited conductivities from 15 to as low as 8 per cent.

This conductivity check, along with parallel chemical analyses, showed that while it was not possible to determine accurately the per cent iron in the castings, the difference in conductivity between the contaminated and good castings was significant enough to permit sorting.

The inspection test was so established that it would reject any iron content in excess of 0.19 per cent. This was accomplished by centering the instrument meter so that a good casting exhibited a conductivity of 17.5 per cent. Thereafter, any casting reading to the left of center was acceptable; any casting reading to the right of center was rejected. Although this procedure caused the rejection of some good castings, it was considered more economical than the possible breaking of more tools.

The sorting operation consisted of placing the instrument probe on each casting and noting the position of the instrument meter. The operator did not read actual per cent conductivity each time; he merely compared each casting to the setting of 17.5 per cent and decided "good" or "bad."

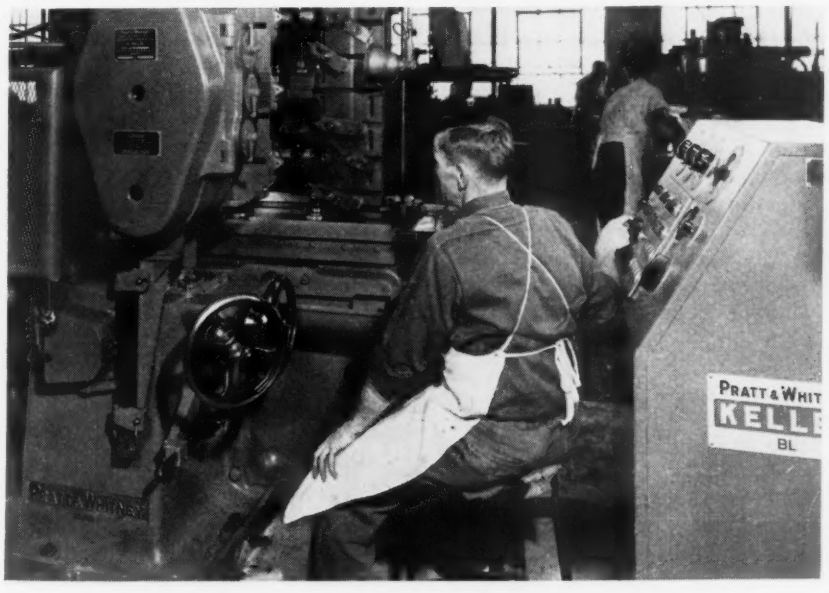
After the castings had been sorted by the conductivity meter, a statistical acceptance sample was taken. All the castings in this sample were found to be acceptable—with the highest iron content being 0.14 per cent.

Conductivity meters are used frequently to sort entirely different alloys. However, it is not common practice to use these instruments for such sorting as described above—with rejection being based on a single contaminant.

It is conceivable that the method can be used in similar cases dealing with a great variety of defects, so long as the defect in question causes a significant change in the conductivity of the base metal.

The instrument described here is known as the Magnatest and is a product of the Magnaflux Corp., Chicago.

LET US TELL YOU ABOUT OUR OPERATION



Pyle's mechanized foundry operation is devoted exclusively to pattern production. Capable of aluminum or magnesium castings, it assures uninterrupted flow of work to machines — keeps entire operation under one roof.

Patternmaking at Pyle may not embrace all the drama of surgery . . . but pinpoint precision and devotion to detail are just as important here as in the operating room.

At Pyle your pattern is prepared by men averaging 19 years experience. From a minutely accurate wooden model, it is cast in our own foundry — designed, equipped and operated exclusively for pattern production. The aluminum or magnesium casting is then tooled on machines best suited to your needs . . . lathes, radial drills, milling machines, planers, hydraulic or automatic duplicators. Flawlessly hand-finished and meticulously inspected, it is shipped to meet your deadline.

The consistent thoroughness of our operation has won us friends among America's most respected firms. May we become friends with you?

PYLE

PATTERN AND MANUFACTURING COMPANY

Muskegon, Michigan

Industry BRIEFS

FORD MOTOR CO., Detroit, is planning construction of a new aluminum permanent mold and die casting foundry on a 130-acre site at Listerhill, Ala. It will contain about 250,000 sq ft of floor space and employ about 800 persons. Construction is expected to begin this summer, and production work will start by the end of 1957. Reynolds Metals Co., Louisville, will construct a new aluminum reduction plant adjacent to the Ford property and will supply Ford with 64 million lb of molten aluminum per year for at least 10 years. The foundry will produce automatic transmission and engine parts.

Beryllium Corp., Reading, Pa., has acquired the capital stock of National Precision Casting Corp., Clifton Heights, Pa., through an exchange of stock. Present management and manufacturing operations will continue unchanged. National is a producer of investment castings by the lost-wax and plastic pattern processes. The acquisition also includes capital stock of Napco Industires Inc., Lenni Mills, Pa., a similar secondary firm with the same management as National.

Mathews Conveyer Co., Ellwood City, Pa., is building new, $1-million plant and office facilities for the company's Canadian subsidiary, Mathews Conveyer Co. Ltd., on Highway No. 2, east of Port Hope, Ont. The factory will be a 210 x 370-ft structural steel frame building. The office building will be a two-story, 100 x 125-ft brick structure joined at the back to the factory.

Metal & Thermit Corp., New York, and **United Chromium of Canada Ltd.,** Toronto, will combine Canadian activities under the name Metal & Thermit-United Chromium of Canada Ltd. United Chromium facilities at 15 Emily St., Toronto, will be replaced by a modern building on a 4-acre tract in northwest Toronto. James Guffie will be local manager.

Haylco Controls Corp., Neenah, Wis., manufacturer of automatic controls for foundry sand systems, is building a new general office and manufacturing plant on a 5½-acre site on U. S. Highway 41 in that city. The one-story brick and steel building will provide 6000 sq ft of floor space. Occupancy is planned in April.

Foxboro Co., Foxboro, Mass., is increasing the size of its instrument training center to accommodate 46 persons, nearly double the number handled previously. Scheduled for completion early in 1956, it will include two 20-student classrooms, two laboratories where bench instruction and service training can be given, an instrument demonstration area and quarters for an expanded teaching staff.

Long Island Foundry Products Inc., 139 West Pulaski Rd., Huntington Station, Long Island, N. Y., has been chartered as a corporation with capital stock of 1000 shares at no par value. Directors are John Degen, 134 West Pulaski Rd.; Louis F. Pipolo, 243 Melville Rd.; and John G. McCarthy, 62 Sammie St., all of Huntington Station.

Corning Glass Works, Corning, N. Y., has established a new Refractories Division to consolidate development, manufacture and sale of conventional refractories, special high-temperature refractories and Corning Glascast mold material for precision casting of metal alloys.

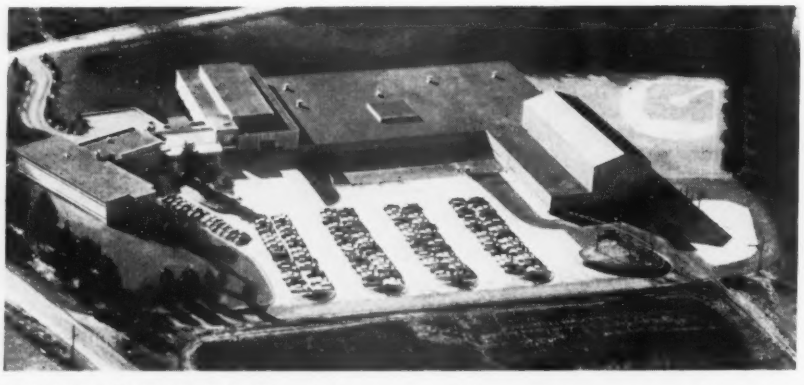
B & T Machinery Co., an affiliate of Buss Machine Works, Holland, Mich., has acquired B & T Engineering & Sales Co., Detroit. B & T Machinery manufactures die casting machines. The merger does not involve any actual change of operation or administration.

I. F. Sales Co., New Philadelphia, O., producer of malleable iron castings, has changed its name to the I-F Mfg. Co. The change, intended to reflect more clearly the nature of the company's business, does not affect its policies or personnel.

Electro Refractories & Abrasives Corp., Buffalo, has established a new product engineering department for its grinding wheel division. The department will be headed by William Eames, product engineer.

Wheelabrator Corp., Mishawaka, Ind., has opened a suboffice in Montreal, Canada. Douglas Lamb is in charge and will serve as a combination sales and service engineer.

Alloy Precision Castings Co., Cleveland, has established new departments for wax investment casting and shell molding. A subsidiary of Mercast Corp., New York, the Cleveland firm is one of the nation's



MILLION-DOLLAR PLANT: Selas Corp. of America has moved from its former site in Philadelphia to this new million-dollar plant in Dresher, Pa. Located at the intersection of Limekiln Pike and Dreshertown Rd., 14 miles north of downtown Philadelphia, the 11-acre site has been developed to provide fully co-ordinated facilities for all the company's activities. Selas develops, designs and manufactures automatic heat treating, melting and other heat processing equipment for metalworking

Dear Reader:

Your attention, please!

We are expanding (with this issue) a service which many of you have used to advantage for several years.

Our Reader Service card enclosures have been re-designed to permit your requesting more information on products and services advertised in each issue of FOUNDRY as well as helpful literature reviewed and new equipment described in the sections set aside by our editors for these "assists" to foundrymen.

This "line of type" means what it says --- we invite you to use the handy postage-paid cards in this issue (see page 201):

For more information, use Reader Service Card, page 201

Coming in May:
A Special Editorial
Report to Foundrymen!

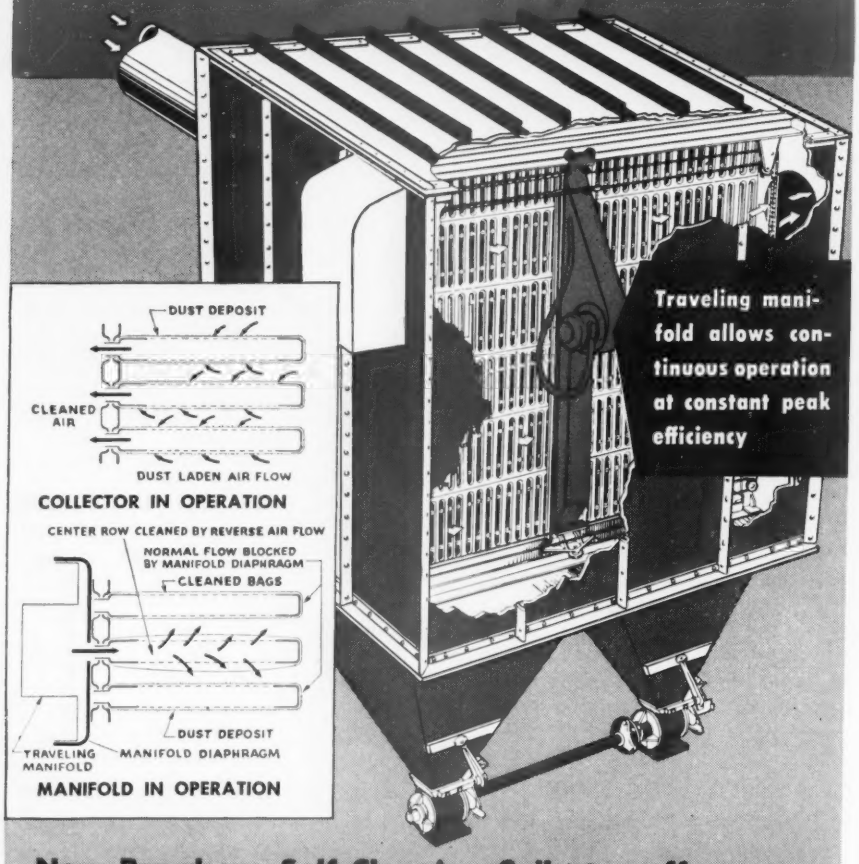
Our May Pre-Convention issue will feature: THE TOOLS FOR TOMORROW's FOUNDRY PROGRESS. Trends and developments to date in foundry practice, technology will be discussed and described. A report on foundry management planning for the future, trends in foundry equipment and supplies, foundrymen-comment on equipment and services "wanted" --- will be important features of this special discussion.

The Convention Story will be reported in full as usual --- we refer, of course, to the 60th Congress and Show of the American Foundrymen's Society to be held at Atlantic City, May 3 to 9, 1956.

**** The May Pre-Convention issue of FOUNDRY will be mailed one week earlier than usual to reach most readers well in advance of the Show and Convention in Atlantic City.

FOUNDRY

NOW! Great news about a NEW Pangborn Dust Collector that MAINTAINS CONSTANT OPERATING EFFICIENCY



New Pangborn Self-Cleaning Collector offers continuous automatic operation, constant air volume and suction, uniform air flow resistance at low cost.

TO MAINTAIN constant efficiency, the Pangborn Self-Cleaning Collector combines the proved efficiency of the cloth screen collector with continuous automatic operation.

A manifold with integral blower slowly traverses the clean air outlets of the screen frames. Covering three rows of screens at any given time, it applies a reverse air current through the center row to remove collected dust from the cloth surfaces. The result is constant high collecting efficiency and continuous operation—shutdown of the system for periodic cleaning is eliminated. Because of design simplicity and unit construction, this unique collector requires lower initial, operating and maintenance costs as well as less floor space than comparable collectors.

For full details, write for Bulletin 915 to PANGBORN CORP., 1400 Pangborn Blvd., Hagerstown, Md.

Pangborn CONTROLS DUST

largest producers of investment castings employing frozen mercury patterns.

Surface Combustion Corp., Toledo, will expand its plant by the construction of a new building immediately adjacent to the east side of its present factory. The new facility will increase productive capacity of the Toledo plant by about one-third. Construction was scheduled to start Mar. 1, 1956.

Fuller Co., Catasauqua, Pa., has appointed Jobe & Co., 344 East 33rd St., Baltimore 18, to be its sales representative for the Baltimore, Washington and Richmond, Va., areas. Jobe maintains a second office at 110 North Eighth St., Richmond.

Griffin Wheel Co., Chicago, is planning construction of a plant in South Colton, Calif., to manufacture cast steel wheels for railroad cars. Plans call for the new facility to be in operation in about a year. It will employ 150 to 200 persons.

Link-Belt Co. has opened a new district office in Shreveport, La., at 3109 Alexander St. It will serve northern Louisiana, southern Arkansas and 14 neighboring counties in Texas. Gerald A. Stone is district manager.

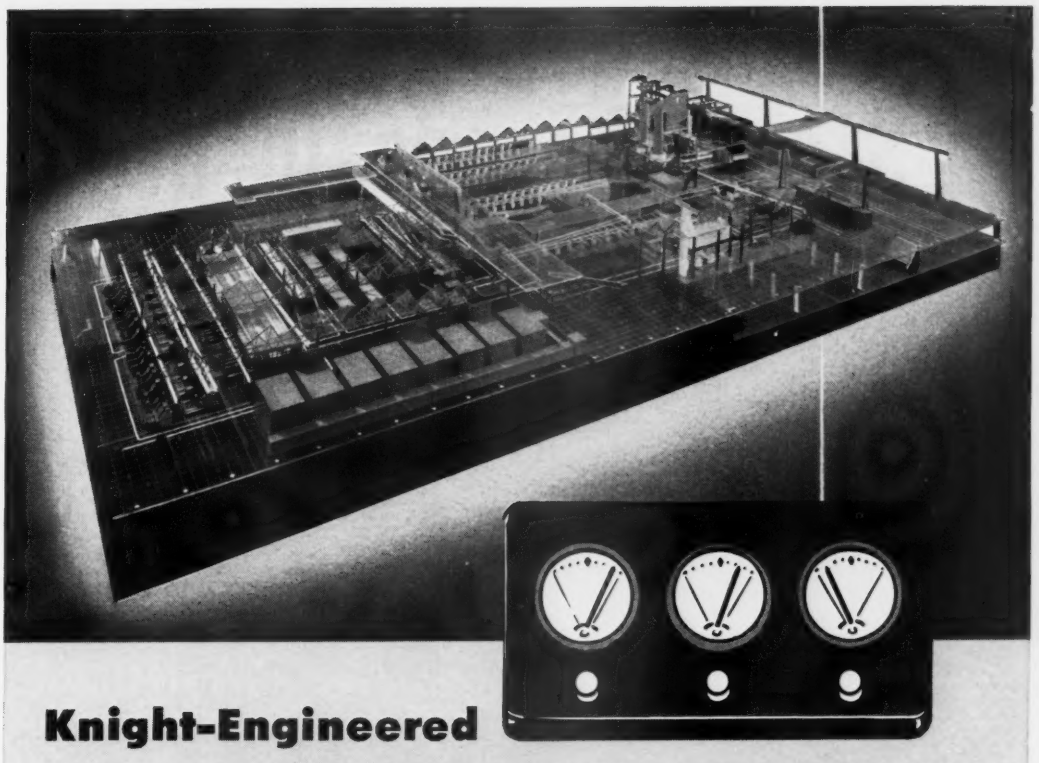
Joy Mfg. Co., Pittsburgh, will build a $300,000 research and development center, organized as a division in Buffalo. Purpose will be to build and assemble models of compressors and blowers.

American Chain & Cable Co., Bridgeport, Conn., has ended the corporate existence of Allison Co., Bridgeport, its wholly owned subsidiary, which now is known as the Allison Division of American Chain.

Colson Corp., Elyria, O., manufacturer of material handling equipment, has opened a branch office and warehouse at 614 Northwest Sixth Ave., Portland, Oreg.

Forklifts Inc., 1500 Paxton St., Harrisburg, Pa., has been appointed to sell and service Clark Equipment Co. fork lift trucks, straddle carriers and powered hand trucks.

Sterling Foundry Co., Wellington, O., is completing an addition to increase floor space available to a total of 190,000 sq ft.



Knight-Engineered
AUTOMATION
increases labor productivity 52% in major foundry

Experienced Knight Engineers, working closely with the client's staff, completed the automation of this foundry unit 18 months ago.

The successful integration of foundry operations into a continuous production sequence, *from raw material to finished product*, increased over-all labor productivity 52%. In one operation alone, 9 men now produce what 53 men formerly produced.

Automation has also accelerated materials handling, established uniform product standards, improved worker morale, increased space productivity 33%, and brought major economies throughout the over-all operation. Necessary changes were scheduled progressively so that automation was accomplished without interrupting production.

The successful operation of this foundry is just one example of Knight's practical experience in the engineering services that increase foundry productivity and decrease unit costs.

Your operation will benefit by the comprehensive experience of Knight Engineers who have completed approximately 400 foundry assignments. A letter will bring a call from a Knight representative at your convenience.

Knight services include:

Foundry Engineering
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Architectural Engineering
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Organization
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Industrial Engineering
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Flexible Budgeting
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Production Control
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Modernization
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Methods
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Materials Handling
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Automation
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Survey of Facilities

Write for your copy of new Bulletin 101— "Professional Foundry Engineering"

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For more information, use Reader Service Card, page 201

Here's How To Cast

Steel Threads in Gray Iron

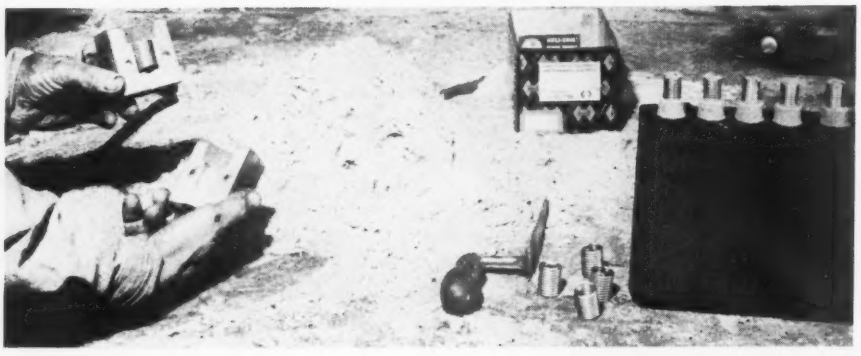


Fig. 1—First step in casting inserts in gray iron is making small sand cores on which inserts are placed in mold. Size of this insert is ⅝-11

Fig. 2—The baked insert cores are placed in holes in the large corebox

Fig. 3—The large corebox is filled with sand. To avoid baking small cores twice, rapid hardening is accomplished by carbon dioxide process

A NEW method of obtaining smooth, durable, corrosion-resistant stainless steel threads in gray iron castings has been developed by Francis Le Baron, vice-president, E. L. Le Baron Foundry Co., Brockton, Mass. The simple process slashes material handling costs and eliminates expensive drilling and tapping on large parts.

Using stainless steel wire thread inserts made by the Heli-Coil Corp., Danbury, Conn., Le Baron places the inserts in the mold on sand cores. The hot metal flows around the outside of the inserts forming a close bond just short of actual fusion.

Standard blast cleaning equipment removes the cores from inside the inserts, providing permanent threads of stainless steel for bolts for fastening the cover to the frame.

Previously Le Baron drilled and tapped threads. This operation required moving castings weighing up to 400 lb to the foundry's machine shop, setting up each casting, making a drilling template as well as drilling and tapping each hole. Casting in stainless steel threads not only gives an improved product but per-

Fig. 4—Francis Le Baron developed new method of casting in inserts

mits Le Baron to speed up shipment of finished castings.

First a small sand core is made (Fig. 1) in a special corebox using fine sand. Cores with inserts are baked for ½-hour at 450-475°F. After placing in holes drilled in the large corebox (Fig. 2), the large core is made (Fig. 3). To avoid baking the small cores twice, the carbon dioxide method is used to harden the large core in the box. This step requires about one minute. The corebox is removed on a standard molding machine (Fig. 5) after the core is hardened. The core with the inserts is placed in the mold (Fig. 6). Stainless steel threads result which receive standard bolts.

Heli-Coil inserts have been used for many years to provide strong, permanent threads in aluminum, magnesium, plastics, wood, iron and steel. However, the usual application method involves drilling, tapping and turning the insert into the hole.

A special insert for casting in was developed by Heli-Coil Corp. in which the coils are wound in tight contact with each other to prevent hot metal from flowing into the female threads and to maintain correct thread pitch. Le Baron uses a fine core sand for the small cores and rams carefully to insure that the sand completely fills the inside of the insert. The coremaker must also be careful not to get sand on the outside of the insert. This interferes with lifting the large corebox and reduces the fusion of cast iron to the insert. Reinforcing screws in the small cores have been found to be necessary. To make the 12 cores required in the casting illustrated requires about six minutes. The cores can be made on a core blower even faster. The inserts shown are ⅝-11 (⅝-in. diam and 11 threads per inch).

During development work insert strength was tested by screwing standard steel bolts into the insert until the bolt sheared. The part of the bolt broken off in the insert was backed out with finger pressure. No

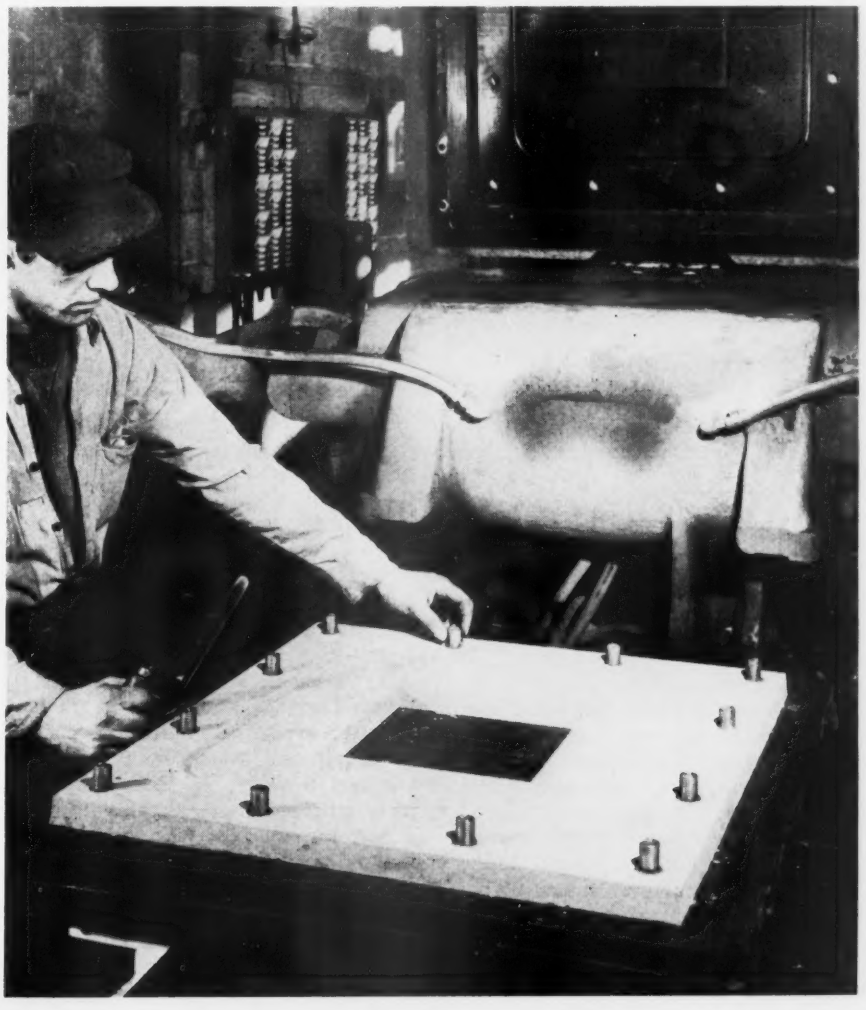


Fig. 5—After core has been hardened, the corebox is drawn on a standard molding machine. In this view, molder checks an insert for hardness

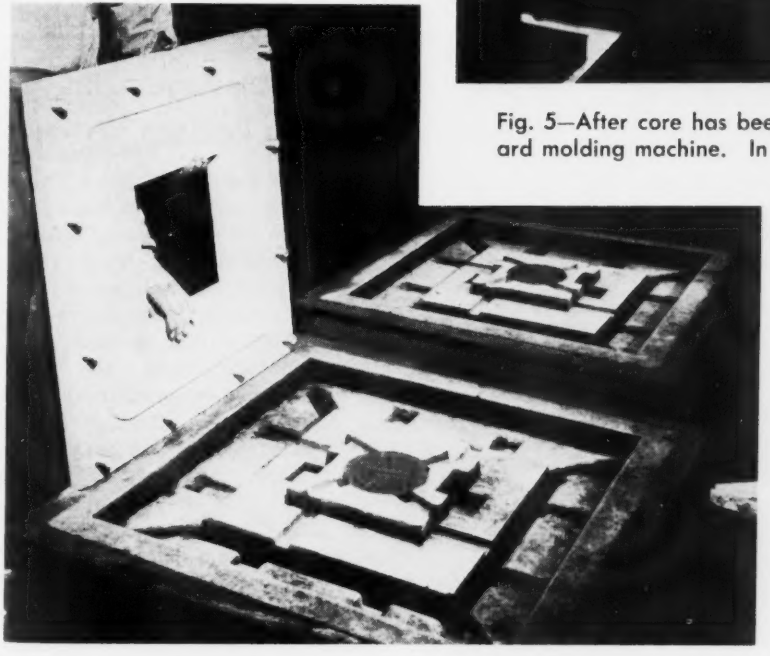


Fig. 6—Core with inserts is placed in the mold. Stainless steel threads result which receive standard bolts

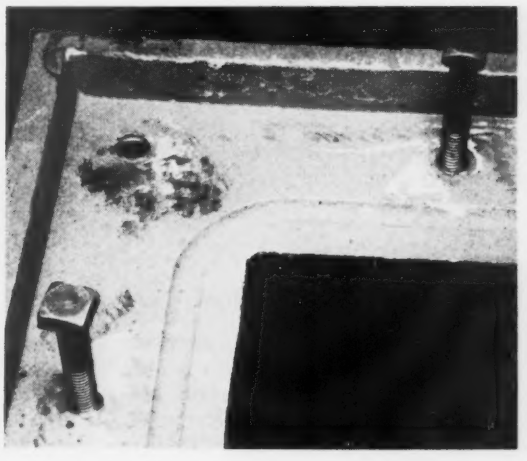


Fig. 7—Hot metal flowing around outside of inserts secures them in the casting with a bond approaching fusion

Thomas H. Conway Jr., right, president, Great Lakes Mfg. & Foundry Co., gets a plaque, given for safe operation, from Earl Turner, carrier representative

SAFE OPERATION PAYS DIVIDENDS

AT Great Lakes Mfg. & Foundry Co., Wyandotte, Mich., the foundry is more than "a good place" to work. It's also a safe place. Like many other foundry organizations, Great Lakes recognized years ago that safety is as important a factor in its operation as production and quality control. Management decided that the waste of time and money due to employee injuries had to be reduced to a minimum just as necessarily as waste of material in process.

Safety obviously is humanitarian; it also is economically desirable, they feel.

As a result of its efforts, Great Lakes for ten consecutive years has earned a credit rate and has operated at 26 per cent below the average for the last 6 years. In 1954, the company suffered no chargeable injuries, a feat for which it was awarded the plaque shown above.

Success of the firm's safety program is based on the assumption that only *people* can make safe operation a reality. Unsafe physical conditions can be detected and corrected, and they are, but interested and enthusiastic personnel are the essential ingredient. Most of the precautions the firm has taken are obvious enough —case histories of accidents show up the same causes over and over, everywhere—but the difference lies in arousing personnel and providing effective supervision.

At Great Lakes, workers watch their fingers and hands during handling of light materials and hand tools. When they are working with liquids which can affect the skin, they wash their hands occasionally. Care during handling means that they grasp heavy objects firmly and don't try to lift more than they safely can.

They lift with their legs to save their backs and use mechanical aids to move particularly heavy or cumbersome objects.

They watch where they're going, avoid both stationary and moving objects, take special care when climbing or working above the floor or grade level and watch for falling material. They recognize that power-driven tools are dangerous and that jobs must be set up properly with point-of-operation guards. They wear eye protection whenever there is danger from flying particles, and they don't permit their familiarity with molten metal to breed contempt for it.

Great Lakes realizes that minor injuries probably are inevitable, but it feels that a completely successful cost picture depends on the prevention of serious, lost-time cases. Its record indicates how well the company has accomplished that goal.

---

damage to the insert was observed.

The insert made for casting in is coiled slightly oversize to allow for the shrinkage of cast iron on cooling. Because the coils are flexible and are not rigid as in a solid bushing, stresses are not concentrated around the insert, and cracking of the casting or of the insert is avoided.

The Le Baron foundry specializes in gray iron castings for manhole covers, gratings and frames, etc.

New Members Are Appointed To Material Handling Group

New appointments to its membership have been announced by the College-Industry Committee on Material Handling Education. Byron W. Saunders, associate professor, College of Engineering, Cornell University, has been re-elected chairman of the group.

New vice-chairmen include: D. H. Bitney, Union Steel Products, representing manufacturers of material handling equipment; George A. Smith, International Business Machines, representing users of material handling equipment; and Harold T. Amrie, Purdue University, representing colleges.

The committee consists of 16 members—eight from leading engineering colleges, four from the American Material Handling Society, representing users of material handling equipment and four from the Material Handling Institute, representing manufacturers. The 1956 program of the CICMHE includes a series of slide films on material handling equipment, a film on conveyors and a seminar for college professors teaching material handling. The seminar is scheduled to be held in Cleveland during the Material Handling Institute's 1956 exposition, which will take place from June 5 to June 8.

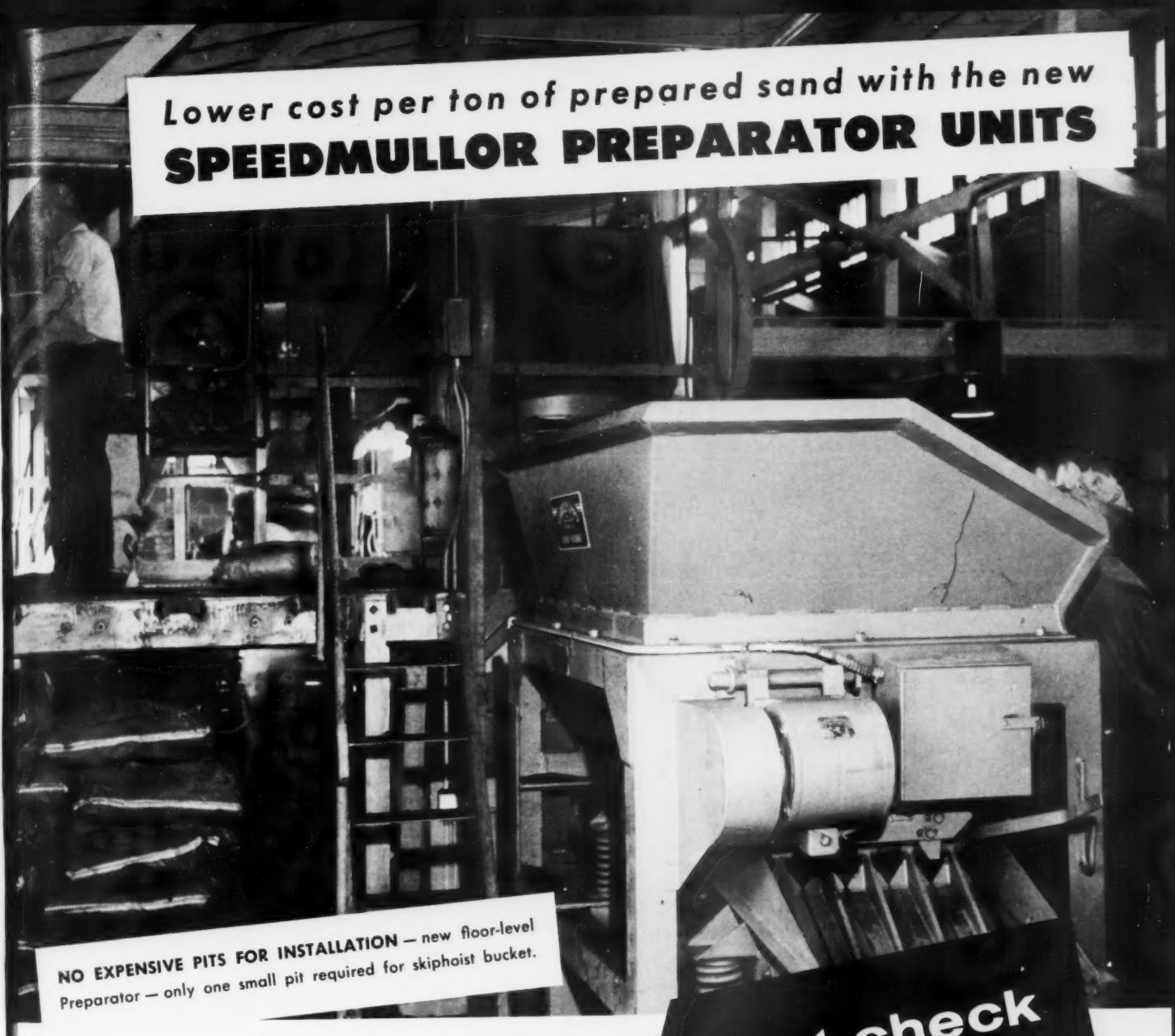
Industry in Los Angeles Combats Air Pollution

Industry in the Los Angeles Basin poured nearly $10 million into air pollution control equipment during 1955. The engineering division of the Air Pollution Control District reports that industry there also invested over $50 million in basic production equipment during the year. Both were record expenditures.

Air pollution law violators taken to court during 1955 numbered 650 per cent more than in 1954. Court cases totaled 2974 in 1955 and only 395 in 1954. Fines assessed against violators rose from $22,575 in 1954 to $139,235 last year. The percentage of convictions rose from 87.5 to 92.3 per cent. During 1955, the enforcement staff was quadrupled, 24-hour-a-day patrols were launched, with two-way radio equipment.

Lower cost per ton of prepared sand with the new

SPEEDMULLOR PREPARATOR UNITS



NO EXPENSIVE PITS FOR INSTALLATION — new floor-level Preparator — only one small pit required for skiphoist bucket.

Just check a few of the advantages

PACKAGE INSTALLATION—READY TO OPERATE—complete sand conditioning and mulling in one complete package — no extras to buy.

LOW MANPOWER COST — one man can deliver shakeout sand to the unit — operate the unit — and deliver prepared sand to the floors.

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HIGH CAPACITY—SMALL AREA—No sand system ever before available offers as high a capacity of thoroughly conditioned and mulled sand from as small a floor area — or at as low a cost.

It will pay you to investigate now — especially if your sand preparation costs are not as low as you would like. Write today — without obligation — to Beardsley & Piper, Division Pettibone Mulliken Corporation, 2424 North Cicero Ave., Chicago 39, Ill.

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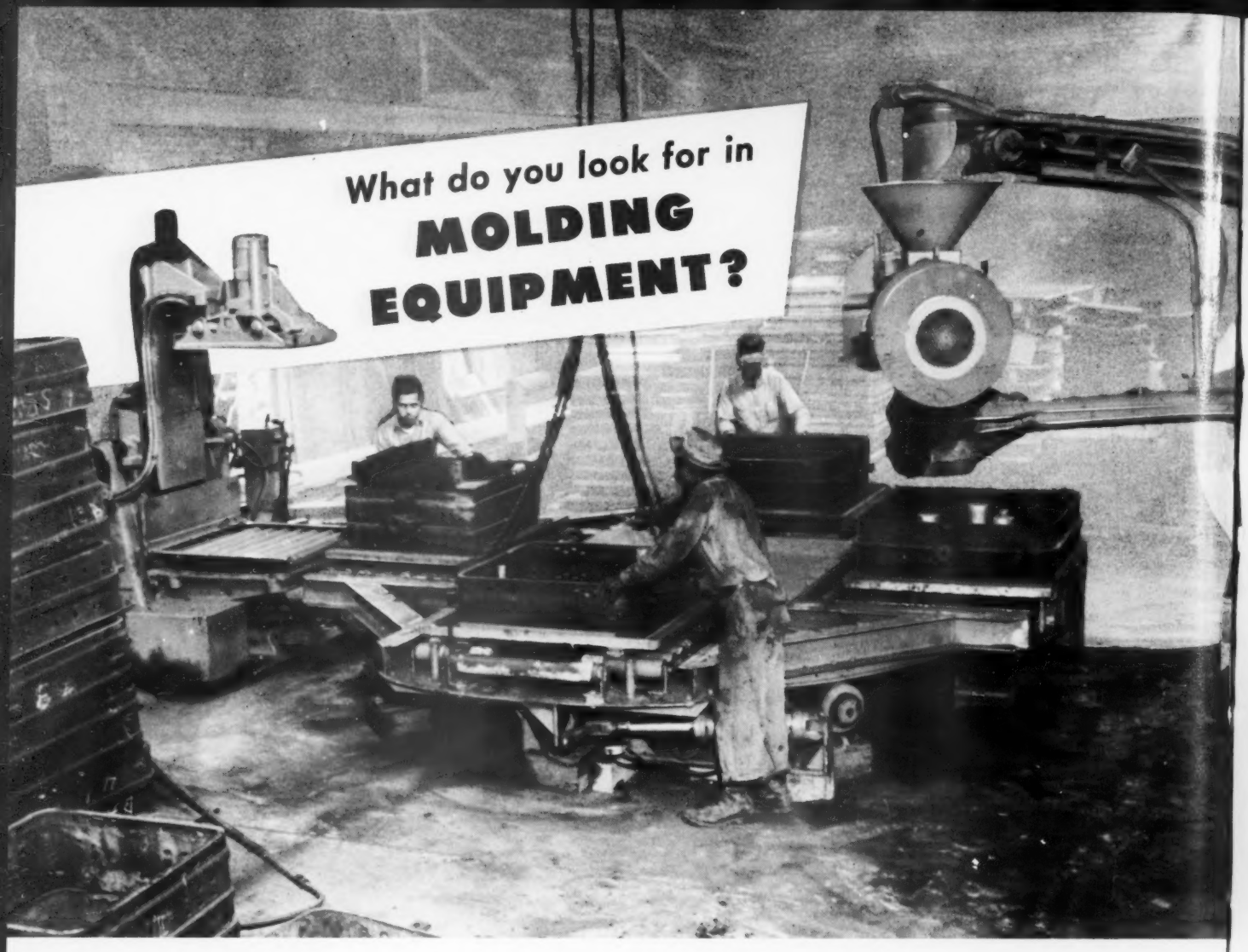
THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF FOUNDRY MACHINERY



IS IT RANGE AND FLEXIBILITY? There's more outright flexibility in these units than will ever be required — handles any size or shape of pattern that will fit on the table and rams one or a thousand molds from each pattern at equally low man-hour costs.

IS IT DEPENDABILITY? Rugged durable B & P construction marks every component of these units. It's in the Sandslinger or Hydra-Slinger, in the turntable, and in the fast accurate B & P Rol-A-Draw. There's a real assurance of lowest maintenance per ton of castings.

IS IT SPEED? No molding equipment can turn out large varied work faster. Here's all of the capacity that can be obtained from four large molding machines. Yet it's all combined in a single compact unit.

IS IT LOW OPERATING COST? Whether it's a four station, or eight station or an even larger unit, all operations can be handled by as few as three men. Here's a unit that will be profitable when operated at full capacity or partial capacity. Here's highest productivity per man-hour.

IS IT LOW INSTALLATION COST? Certainly no multiple molding machine installation can approach the low cost of an equally productive multiple station Slinger Roto-Mold unit.

One slinger does all the ramming, one rollover handles all of the molds. The result is more productive capacity for your equipment dollar.

IS IT SIMPLICITY OF INSTALLATION? Compare the ease and simplicity of delivering all the sand to a single station—of moving all rammed molds from a single station — to the sand delivering and mold handling problems of multiple machines. Then you'll see why these units are so widely accepted, so successfully used.

If you can't afford to get along without any of these important features write now for further information.

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units provide all these features

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF FOUNDRY MACHINER

MALLEABLE FOUNDERS MEET IN CLEVELAND

Discuss Technical and Management Subjects

SEMIANNUAL meeting of the Malleable Founders' Society included discussions of technical and management subjects, as well as reports of committee activities. Held in Cleveland Jan. 20, the meeting was presided over by the society's president, Carl L. Liebau, Federal Malleable Co., West Allis, Wis.

Mr. Liebau pointed to the wide extent to which society members are participating in the organization's activities and added that the society is striving to increase the degree of participation. Referring to trade associations, he termed them the greatest instrument of our time for preserving the small business enterprise. The modern day trade association, he said, is a pipeline of life blood; in the case of the malleable industry it furnishes statistics on industry conditions, knowledge of industrial relations, sales promotion tools, research information, cost accounting information and much more data needed in daily operations.

On the subject of research activities, Mr. Liebau said that all industry spends an average of about 2 per cent of its sales on such work. If the malleable foundry industry were to meet this average, it should spend not less than $6 million annually on research.

"The atmosphere in which the trade association strives today is the best we have experienced in 25 years," he added. "Complimentary statements are made about trade associations by men in high government positions. Attorney General Brownell, quoting the report of the Attorney General's national committee to study the antitrust laws, said last spring: 'Antitrust requires distinguishing constructive trade association activities, operating to promote competition, from those which unduly limit competition among members or with outsiders.' "

In referring to the society's committee work, Mr. Liebau announced that the Research and Product Improvement Committee is to be merged with the Technical Council.

Results of several research projects sponsored by the society were discussed by James H. Lansing, technical and research director. He cited examples of a number of castings in which improved yield and reduced cost had been effected through use of principles developed in a study of gating and feeding. In some cases yield was increased from an original of 44 per cent to a final of 66 per cent.

In connection with studies of the basic properties of malleable, stress rupture tests at elevated temperatures indicate that a new field for malleable use may shortly be developed.

Dropping from high to low temperatures, there was a comment with regard to yet-unpublished tests which show malleable to have excellent subzero service properties.

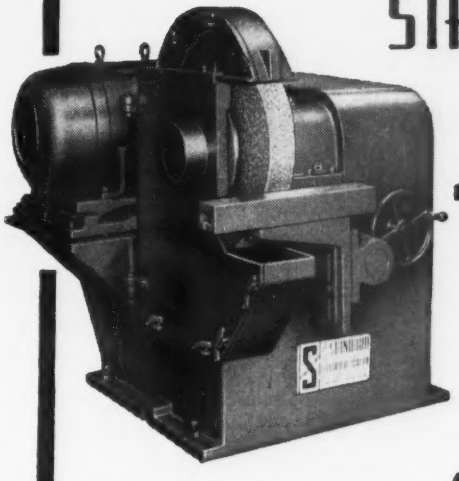
As chairman of the Market Development Committee, J. W. Hallock, Albion Malleable Iron Co., reported on discussions at the society's sales engineering clinics held last fall. These discussions indicated the probable increase to be expected in malleable iron consumption the next ten years, based on anticipated expansion in the national economy and population growth.

About one-half of the society's revised handbook has been completed,

51% SAVINGS IN WHEEL COSTS!

(says a Midwestern foundry)

. . . SINCE WE INSTALLED STANDARD INFINITELY VARIABLE SPEED SNAGGING GRINDERS



Wheel Cost Per Ton of Castings Ground:

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Single and Twin Wheel Grinders 5 hp, 20" to 100 hp, 30" Wheels

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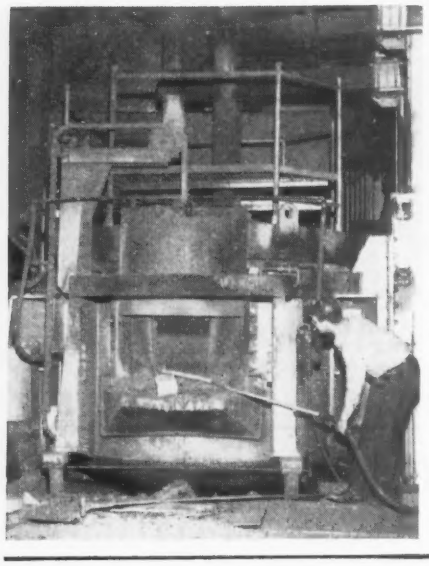
DUST and FUME topics

WHEELABRATOR CORPORATION ■ Mishawaka, Indiana

Wheelabrator® dustube® collector traps electric furnace fume, improves working conditions



Constant emission of fine carbon particles from an electric furnace in a large Michigan automotive foundry is controlled successfully by a continuous automatic Wheelabrator Dustube Collector.

Excess metal remaining after pouring ladles are filled is dumped in the holding furnace so as not to cool down and to facilitate its later use when enough has been collected.

Fine carbon particles from the heated metal are prevented from permeating the foundry atmosphere and becoming a source of irritation by the efficient operation of the Wheelabrator Collector.

No tools necessary for installing or replacing individual cloth tubes

Each cloth tube in a Wheelabrator dust collector has a loop at the top and a flexible steel ring sewed in the bottom. These features permit the tube to be slipped on to the shaker mechanism bar and to be inserted in the cell plate by hand, without tools.

Besides facilitating original installation, the simplicity of the operation also makes possible quick and simple replacement of tubes.

Foundry eliminates dust from annealing pots, sand handling

The extremely dusty operations of packing and unpacking pots in which hard iron castings are annealed are ventilated by a Wheelabrator Dustube Collector at the Ontario Malleable Iron Company Ltd. Despite heavy volumes of dust, work areas of this foundry are kept exceptionally clean.

Efficient dust control brings savings in foundry operations

Uncontrolled dust hampers production and increases maintenance costs. Wheelabrator Dustube cloth-tube-type collectors trap dust at its source and filter it from the air stream. Thus, hidden expenses are eliminated from many foundry operations.

For more information, write today for your copy of Catalog 372C.

WHEELABRATOR
CORPORATION

505 S. Byrkit Street, Mishawaka, Indiana

it was announced by H. E. Steinhoff, Wagner Malleable Iron Co., Decatur, Ill. This book is expected to be available next spring.

A brief report on steps taken by the society in opposition to the government's liberal policy concerning iron and steel scrap exports was given by Lowell D. Ryan, managing director. Mr. Ryan also detailed results of a survey of capital expenditures by the malleable castings industry. This survey report dealt with expenditures for capital improvements and for expansion of capacity, amount of investment per worker, and related ratios and statistics covering the member companies which participated in the survey.

The report concluded with a comment on national projections as to capital expenditure requirements between now and 1965 and indicated what the malleable industry would need to do to keep abreast of national trends.

Two national meetings of the society will be held this spring, it was announced. The annual Market Development Conference is scheduled for Apr. 12-13 at the Edgewater Beach Hotel, Chicago. A meeting devoted to technical and operating practices in malleable iron foundries, the first conference of this type sponsored by the society, is planned for May 24-25 in Cleveland.

American Brake Shoe Forms Company in United Kingdom

American Brake Shoe Co., New York, is planning the formation of a new company in the United Kingdom to manufacture precision ferrous castings. The new firm will be a joint venture of Brake Shoe and F. H. Lloyd Co. of England.

Principal function of the British company would be to fill the growing demand in the United Kingdom for castings for jet planes and tire molds. The technical process for the operation was developed in Brake Shoe research laboratories and has been used in the United States for several years.

Bernard G. Drummond has been appointed director of Brake Shoe's Overseas Operations, a new department created to expand the company's foreign activities through licensing arrangements and joint ownership of overseas operating companies. Mr. Drummond has been executive vice president of the company's Sintermet Division.

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Steel-Grip makes a complete line of safety apparel made from Jaxcolite materials. The list is shown on this page. We earnestly urge you to send for trial swatches of this material and make any tests you want. It may prove to be *THE* answer to safety problems long unsolved. Send today.

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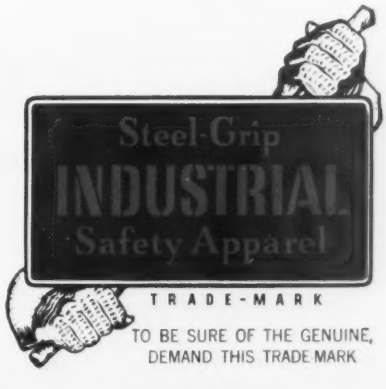

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Coats	Sleeves
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Send for trial garment and prove its superiority for yourself.

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For Pit, Crucible and Reverberatory Furnace Linings the ℞ is Norton CRYSTOLON* silicon carbide refractory cement. CRYSTOLON material stands temperatures up to 3050°F without softening, spalling or cracking, and its extreme density assures great resistance to slag attack. Another application for CRYSTOLON cement is as lining material in the slag troughs of front slagging cupolas.

℞ for more melts-per-lining

Norton refractory cements are engineered and prescribed for longer, lower cost service across the range of furnace applications

For Lining Low Frequency Induction Furnaces. Many foundries melting nonferrous metals and malleable iron report that Norton ALUNDUM* fused alumina refractory cement provides extra long life. This high-melting, long-lasting cement is also prescribed for use in holding ladles, desulphurizing ladles and heat treating and sintering furnaces.

For High-Frequency Induction Furnaces, Norton MAGNORITE* fused magnesia refractory cement is expertly engineered to provide the maximum number of heats per lining. It withstands temperatures up to 3250°F, its high-rammed density resists metal penetration, erosion and chemical attack, and it is free from shrinkage cracks that often cause furnace failure.

The right ℞ for you

Working with ALUNDUM, CRYSTOLON, MAGNORITE and Fused Stabilized Zirconia materials, Norton technicians will help you find the exact ℞'s — *engineered and prescribed* refractories — you need for more efficient furnace operations. For details, see your Norton Refractories Engineer, or write to NORTON COMPANY, Refractories Division, 302 New Bond Street, Worcester 6, Mass. *Canadian Representative:* A. P. Green Fire Brick Co., Ltd., Toronto, Ontario.

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Making better products... to make your products better

Job for College Teacher Wins Plant Merit Award

University and Industry Co-operation Helps Both

By Robert I. Mitchell*

AT LEAST two big problems bother conscientious college instructors. One of them, particularly applicable to men in the fields of business administration and engineering, is the difficulty of keeping close contact with the practical problems that face industry. The second is the matter of inadequate salaries, especially in the smaller private schools. At Duriron Co., Dayton, O., we think we have discovered a way to mitigate both of these problems and at the same time to help ourselves as well as the university teachers and administrators.

In April, 1953, we arranged with a relatively young assistant professor and officers at the University of Dayton (a private school) for him to be hired as a staff assistant to the director of personnel. In the formative stage of this program, he was hired at an hourly rate, but it was determined later that an annual salary would be a better form of compensation for all concerned. Dr. James C. Hodgetts—Jim Hodgetts—became an actual employee of the company. As such, he was able to overcome many of the handicaps of the consultant and outside expert.

It was understood that Dr. Hodgetts would spend approximately 20 hours a week on the average throughout the year for us, but that his college work would have first priority on his service. He was to be given many kinds of assignments, some relatively routine personnel activities and some special problems involving policy recommendations. It was understood, however, that the problems involved would be related to his field of teaching and would be actual, practical situations arising from specific needs in the plant. It also was understood that Dr. Hodgetts would be free from attempts to indoctrinate him in such things as free enterprise and management slants on labor legislation, etc.

We have been extremely satisfied with this arrangement. We have had the opportunity to see a young man develop greatly in his ability to per-

*Mr. Mitchell is director of personnel and industrial engineering, Duriron Co., Dayton, O. His description of the company's practices, as detailed in this article, earned the Research Institute of America's award of merit. Such awards are given "for effective contribution to the development of executive skills in human relations."

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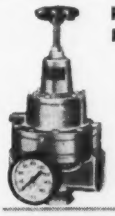

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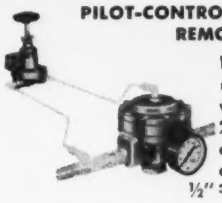

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Reduce line pressures up to 400 psi to maximum delivery pressures of 50 or 175 psi. 2 inlet ports, 3 outlet ports. ¼". Series 3A2-B.

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Reduce line pressures up to 250 psi to maximum delivery pressures of 40 or 60 psi. ¼". Series 1505.

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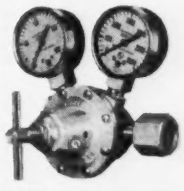
For water, oil, non-corrosive liquids up to 200° F. Reduce line pressures up to 400 psi to maximum delivery pressures of 50, 75, 125 or 250 psi. ⅛" to 1" incl. Series 2H.



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For saturated steam and hot water up to 450° F. Reduce line pressures up to 400 psi to maximum delivery pressures of 50, 75, 125 or 250 psi. ½", ¾", 1". Series 2B.

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form in both an industrial and an academic situation. We also have had the privilege to see Dr. Hodgetts leave our organization to assume greater responsibilities in the field of education. He now is head of several departments in the School of Business Administration at Rider College, Trenton, N. J, and he has told us that he would not have had this opportunity without the practical experience paralleling his academic responsibilities.

We feel, incidentally, that the salary we paid Dr. Hodgetts was more than returned by his handling of many situations in our plant. He worked on such things as wage surveys, foreman job analysis, job evaluations, grievance investigations, preparation of economic data, study of contract clauses for contract negotiations and other problems. At the same time he brought many valuable fresh ideas to our plant.

Our experience with Dr. Hodgetts was so good that we now have another university professor, Lloyd Brenberger, employed on a similar part-time basis. Mr. Brenberger is head of the Department of Industrial Engineering at the University of Dayton. As a company employee, not a consultant, he is securing a completely candid picture of our industrial engineering operations.

Safety Council Publishes New Accident Prevention Manual

The National Safety Council, Chicago, has published the third edition of its *Accident Prevention Manual for Industrial Operations.* An encyclopedia of safety with data on every aspect of industrial accident prevention, the 1341-page new edition contains 43 sections, 17 of them new and the others extensively revised and brought up to date. It is the product of three years of research, writing and revision by NSC engineers and other safety specialists from industry, government and other groups.

The manual explains how to set up safety committees, maintain interest in accident prevention activities and develop favorable publicity and public relations. There are chapters on accident records and injury rates, accident investigation and costs and workmen's compensation insurance. Technical information covers such subjects as pressure vessels, handling materials, conveyors, machine tools, welding, portable power tools, electrical hazards, inflammable liquids and many others.

Priced at $13.50, the *Accident Prevention Manual* may be purchased from the National Safety Council, 425 North Michigan Ave., Chicago 11.

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Is your present abrasive tough enough to prove itself in performance? You can't judge an abrasive by looks, claims or promises. The only test of any abrasive is its *cost per ton of castings cleaned.* Because of exclusive metallurgical characteristics, Malleabrasive gives you the lowest cost per ton cleaned of any premium abrasive on the market! This has been proved in hundreds of production tests by users throughout the country. Prove it in your own production test—put muscle behind *your* blast cleaning with Malleabrasive! *We GUARANTEE that Malleabrasive will give you lowest cost per ton of castings cleaned.*

To order Malleabrasive, or for additional information on running a test, contact Globe Steel Abrasive Co., Mansfield, Ohio.

Sold and recommended by Pangborn Corporation, Hagerstown, Md.

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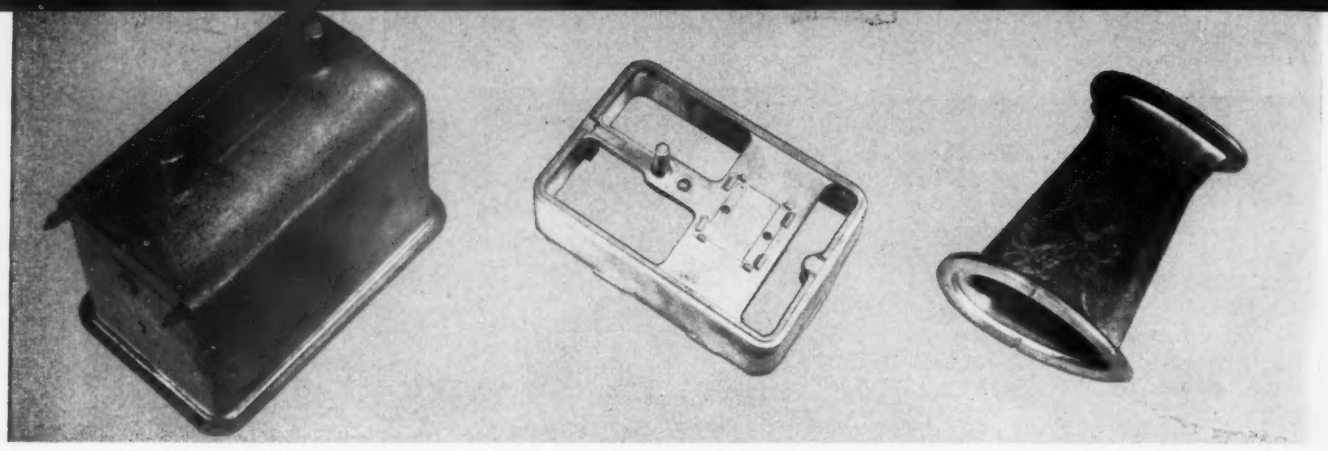


Castings shown here are typical of those produced in the new permanent mold machine

PERMANENT MOLD CASTING MACHINE

Is Electronically Controlled

By THOMAS A. DICKINSON

AN electronically-controlled casting machine developed by Automation Engineering Corp., Los Angeles, currently permits the production of nonferrous castings in permanent molds with rapid speed and unusual precision.

Fundamental purpose of the machine is to eliminate the human errors usually responsible for defects in castings. This goal has been achieved so successfully that the device can be satisfactorily operated by a man with almost no experience in foundry work.

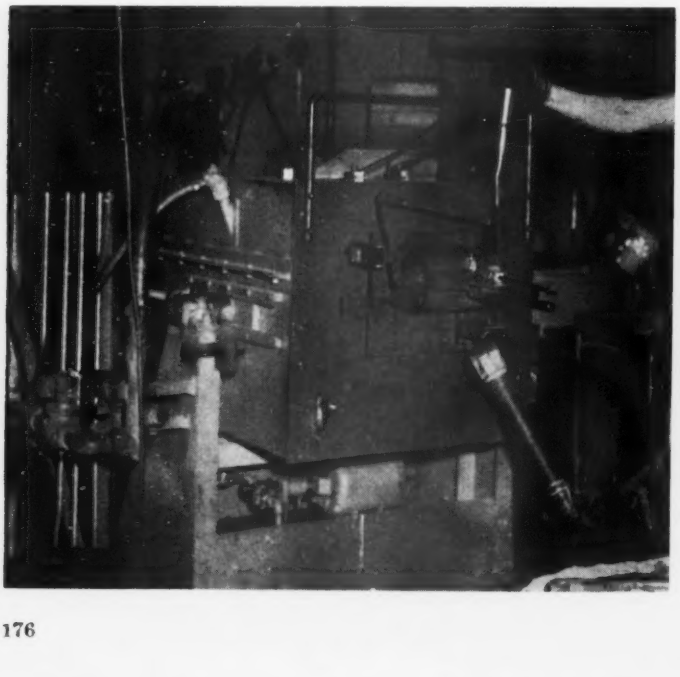
In essence, the machine is a gas-fired holding furnace with attachments on one side for a permanent mold and a hydraulic system which makes it possible to fill an attached mold by tilting the entire unit. Standard sizes are of 200, 300 and 500-lb capacities.

The machine's electronic controls —which regulate molten metal and mold temperatures, pouring rate and the casting cycle—can be preset for casting any nonferrous metal. The operator has only to actuate the hydraulic system at the beginning of each cycle and remove a solidified casting when the cycle is complete.

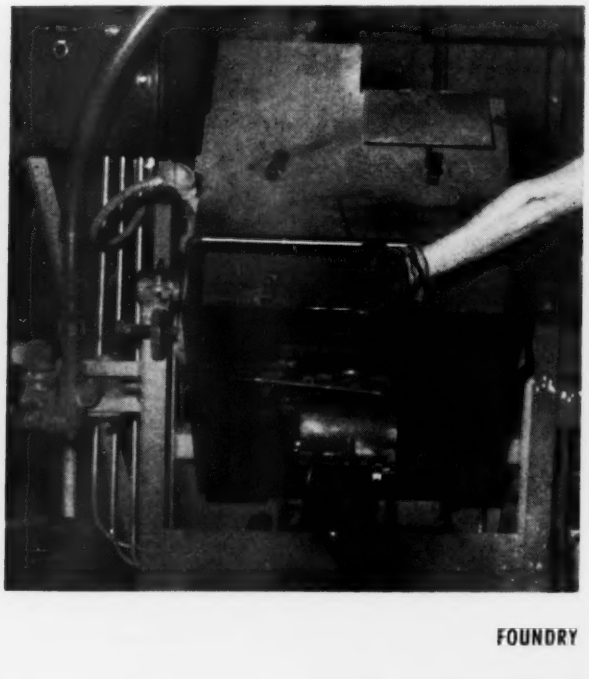
Function of the electronic controls is to react to impulses received from "sense elements," much the same as does the human brain. The sense elements in this instance include:

1. A pyrometer and thermocouple, which enable the "brain" to maintain specified temperatures within ±2° F.
2. An adjustable hydraulic restrictor valve, which governs the pouring rate.
3. An adjustable timer, which is actuated each time the furnace is tilted and which releases a solenoid-

Operator grasps control that closes permanent mold and actuates hydraulic tilting system at beginning of cycle



Operator releases control when unit has tilted to this point. Machine returns automatically



Pangborn Rotoblast® speeds production at Beloit Iron Works!

Blast cleaning with a Pangborn Rotoblast Table-Room, Beloit Iron Works, Beloit, Wis., has upped production from 1.2 tons per hr. to 3.25 tons per hr.—an increase of 170%—while cutting labor costs!

And at Link-Belt, too!

Faster cleaning with Blastmaster Rotoblast Barrel at Olney Foundry Division, Link-Belt Company, Philadelphia, has stepped up production 20% to 25%!

Tables, rooms, barrels—whichever blast cleaning machine best fills your cleaning needs, Pangborn Rotoblast will speed *your* production.

Pangborn Rotoblast cuts operating time by cleaning *quickly,* throwing a heavy volume of abrasive over a large surface area. The result is higher production and, therefore, lower cleaning costs. Add the "plus" benefits of reduced labor costs and better cleaning quality and we think you'll agree Pangborn Rotoblast is worth investigating. Take a few seconds now to send for more information—it can save you thousands of dollars later.

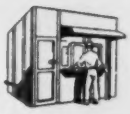
Write for Bulletin 227 to PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Blast Cleaning and Dust Control Equipment.*

Pangborn

BLAST CLEANS CHEAPER

Rotoblast Blastmaster® & Continuous-Flo Barrel

Rotoblast Tables & Table-Rooms


Special Blast Rooms & Cabinets

Pangborn Dust Control Equipment

Malleabrasive® Shot & Grit

Distributors for Malleabrasive and Tru-Steel Abrasives

operated selector valve in order to return the unit to its upright position when the casting cycle is complete.

An operator can't make mistakes in using the machine, once it is properly adjusted for a given production run; if operating conditions are not within allowable limits, the controls won't allow him to inaugurate a casting cycle. In fact, the machine becomes inoperable even if the controls or the sense elements fail to function properly.

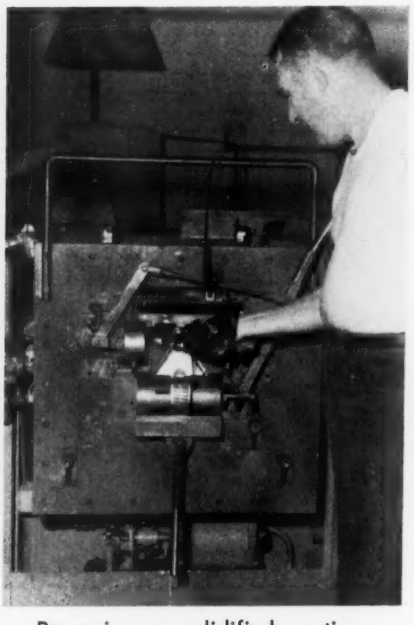
With very few exceptions, it has been found possible to keep the equipment in perfect operating condition by employing simple maintenance measures, such as changing all electronic tubes in the control system once every six months.

Setup time required to begin a new production run with the machine rarely exceeds 30 minutes. Consequently, it is possible to maintain production with a reasonable degree of efficiency where several different molds must be installed on the unit each day. However, the equipment naturally is most economical on long production runs.

Because his physical efforts are not conducive to fatigue, and because he has no control over the number of castings he makes per hour or per day, an unskilled operator of the machine can easily attain the productivity of two highly-skilled workers in a conventional permanent mold foundry where no frequent changes in tooling are required.

If a number of different molds must be used each day, the machine has the economic advantages of producing virtually no rejectable castings (even when the highest quality standards must be maintained) and of minimizing the amount of finishing the castings must receive.

Exhaustive tests have shown that as-cast items made with the new equipment consistently have the finish and dimensional tolerances of pressure die castings and a dense and homogeneous grain structure. The improved density and structure result from temperature control and regulated pouring.



Removing a solidified casting

Weights of the castings have ranged from a few ounces to several hundred pounds. Comparisons have indicated that the same castings would have weighed 5 to 10 per cent less, due to lower density, in conventional permanent mold and sand castings, respectively.

Rejectable castings made with the new machine are said to have been nil where normal commercial quality standards had to be maintained. Where aircraft quality standards have prevailed, the rejects reportedly have averaged under 0.25 per cent.

Meet today's need for...

HIGHER EFFICIENCY

Use PORITE Ceramic Strainer Cores

If you *now* use sand strainer cores—here is a real opportunity for higher efficiency in your pouring operations! Porcelain Products' *ceramic* strainer cores are a proven factor in providing cleaner, slag-free castings—reducing foundry rejects—contributing to more efficient foundry operation.

Porite cores permit controlled pouring—will not spall, erode, or disintegrate during pouring—reduce machining time through cleaner castings. Bonded with interlocking refractory crystals, Porite Ceramic strainer cores withstand high heat, thermal shock—can be stored indefinitely.

Write today for sample cores to make your own efficiency test—FREE.

60 years Porcelain Products, Inc. PP INC.

FINDLAY, OHIO

At one time, the machine was used to cast 450 air valve bodies for use in supersonic fighting planes. Because the bodies had to operate at pneumatic pressures up to 3000 psi, it was necessary for each casting to withstand a 7500-psi burst test before it could be accepted. More than 50 per cent of these bodies had been rejected when they were made with standard permanent mold foundry facilities; yet only one of the 450 machine-cast units failed to survive the burst test. The one rejection, incidentally, was due to a tiny pinhole in a boss.

Automation engineers currently are designing conveyors and related accessories which they believe will permit the operation of their new machine on a fully automatic basis. In addition, they have plans which may eventually lead to the use of similar equipment in the production of both ferrous and nonferrous castings in sand molds as well as in permanent molds.

Steel Founders' Society To Hold Annual Meeting

Annual meeting of the Steel Founders' Society of America will be held at the Drake Hotel, Chicago, Mar. 19-20. The program will open Monday morning with talks by society officers and staff members. These talks will provide the subject matter for a Discussion 66 session in the afternoon.

Annual society awards will be presented at a Monday luncheon, and the meeting will be concluded with a luncheon the following day. Program details follow:

Monday, Mar. 19

8:30 a.m.—Registration

10 a.m.—Society Session: "We Audit our Progress," A. J. McDonald, president; "SFSA Finances," R. G. Parks, treasurer; "The Trap or Triumph of the Future," F. Kermit Donaldson, Executive vice president; "Task Force in Operations," C. W. Briggs, technical and research director; "Doors to the Market," G. K. Dreher, secretary.

12 noon—Reception

12:30 p.m.—Luncheon: Presentation of Technical and Operating Medal; presentation of Steel Foundry Facts Award; special awards, A. J. McDonald; remarks of president-elect.

2 p.m.—Film, "The Steam Turbine,"—An educational problem.

2:30 p.m.—Society Session: "Remarks of Counsel," Chauncey Belknap; "Discussion 66," Howard F. Park Jr., moderator.

5 p.m.—Reception

Tuesday, Mar. 20

9 a.m.—Registration

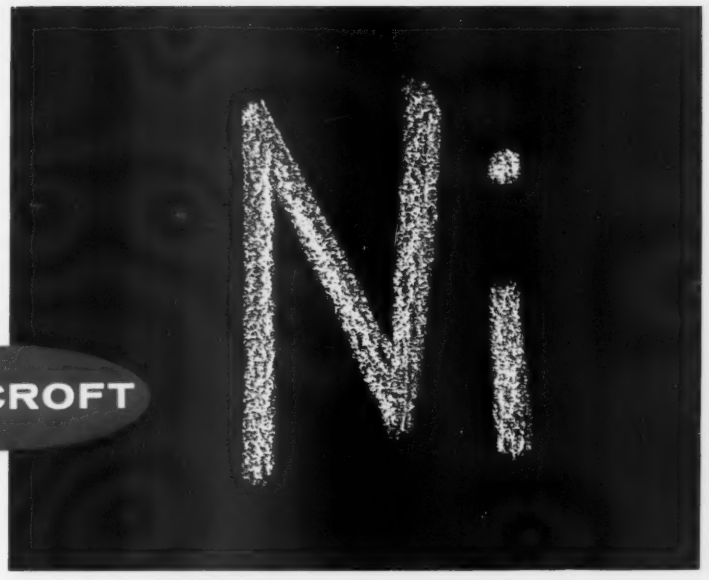
9:20 a.m.—Film, "The World that Nature Forgot."

9:50 a.m.—Management Session: "Training Sales Engineers for Engineered Products," John Gammell, director of graduate training, Allis-Chalmers Mfg. Co., West Allis, Wis.; "Labor, the Government, and You," Lee C. Shaw, Seyfarth, Shaw & Fairweather, Chicago; "Have You Tried Listening?" Wesley Wiksell, Louisiana State University, Baton Rouge, La.

12:15 p.m.—Reception

12:45 p.m.—Luncheon: Remarks, A. J. McDonald; "Where Are We Heading?" Tom C. Campbell, editor-in-chief, *Iron Age*, Philadelphia.

BLAZING THE HEAT TREAT TRAIL WITH HOLCROFT



LET'S TALK ABOUT THE
NICKEL SHORTAGE

Today's shortage of nickel—caused by government stockpiling—has important repercussions for potential buyers of heat treat furnaces.

Heat-resistant alloys may be used in radiant tubes, rails, and other interior sections of the furnace only when nickel is readily available.

That's why we have developed a furnace to meet this challenge—*one that requires no alloys,* yet will meet all the requirements of trouble-free life, low cost, stepped-up production, and high quality control. This is just another example of Holcroft pioneering in furnace design. Better investigate—right now!

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- 1955—Developed a bantam-sized batch furnace using a minimum of alloys.
- 1954—Developed "Lo-Dew" generator for producing exothermic and endothermic atmospheres.
- 1951—Installed silicon carbide skid rails in conveyorized furnaces.

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CANADA: Walker Metal Products, Ltd., Windsor, Ontario

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Core baking, pasting and mold drying ovens as well as casting conditioning and heat-treating ovens are available in standard units.
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Car Type Core Oven.
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Three Compartment Rack Type Core Oven.

Man to Man

By RALPH L. LEE

Listening and Leadership

"Without exception, every good boss I ever had and every outstanding leader I really learned to know listened more than he talked"

WITHOUT exception, every good boss I ever have had and every outstanding leader I really have learned to know had one personal trait in common: All of them listened more than they talked. After I had quizzed oodles and oodles of employees as to what they would like to have in a boss or leader, the majority said, "I want a boss who will listen to *me* once in a while."

Being an instinctive chatterbox myself, running off at the mouth at the slightest provocation and frequently at the wrong time and place, to my regret, I have been curious for years as to whether leaders who listen do it because they were born that way or had figured out the advantage to be gained by it and practiced it (like learning to play the piano) into a fine art.

In any event, I know beyond all question of a doubt that accomplished listening goes hand in hand with effective management and supervision and is generally the key to mutually beneficial employee relations.

After mulling this simple word "listening" over and over and studying it from every angle, I don't think there can be any doubt that leadership listening is a whale of a lot more than just keeping the trap shut. As we all know, listening only begins with the ear drums. Unless those little hairs inside the inner ear transmit the vibrations they receive through the telegraph system of the nerves to the brain for recognition and evaluation there really is no sound.

When you get right down to it, listening is done in the brain, which, being a one-track device, can only concentrate on one thought at a time. It can hop and skip from thought to thought, but it cannot straddle two thoughts at the same time. Even a juggler with six balls in the air and two in his hands can't think of all of them at once, only one at a time—the one he catches and the one he starts off on its upward flight, just for a split second each.

Unless the decks of the mind are swept clean of what we are going to say when the other fellow stops for a breath, or maybe before, we are not listening. Neither are we listening in the true sense of the word if our minds are haunted by what we are going to do when he finally gets the heck out of here.

This being the case, anyone, no matter how full of genius or responsibility, who continues to sign letters, requisitions, checks or stuff or shuffles papers as he says to his visitor, "Go right ahead, I'm listening," is telling one unmitigated fib, whether he realizes it or not. He is pretending the impossible, while at the same time insulting the intelligence, pride, rights and honor of the speaker. There is no one unimportant enough to deserve such an insult, it seems to me.

As I see it, unless the picture screen of the mind is swept clean of all the things we have to do or want to do, we can not get the nubbin of what really is on the mind of the other fellow or even begin to develop listening into an art. The amazing thing to me is that even with an affliction of running off at the mouth, such as mine, we can learn with practice to slam the door on all of the cats, dogs and bats of self-interest which forever are trying to swoop into our consciousness and wreck our efforts to concentrate—not only in conversation, but also while we are alone, trying to work out a problem.

Although I have found that it takes one whale of a lot of will power in addition to practice and still more practice, we *can* whip our meandering minds into shape and make our imaginations behave. I honestly believe that we can't do the job of listening that real leadership takes without a well disciplined imagination.

Swinging over to the other end of the scale, I think we can say, as a rough generality, that instinctive or habitual chatterboxes feel less certain of themselves and less secure in their relationships with others than those who do more listening. Although, at first thought, this may seem paradoxical in the light of the table pounding self-asserter and conversational bully, a quiet and studied analysis of the subject would, I believe, bring out the talented and accomplished leader-listener as one who knows his weaknesses and limitations, but also knows his proven strengths and capabilities.

Balancing one against the other, he finds the account favorable for all practical purposes, feels quite comfortable in any company and has no fear of what any member of the company might have to say. In fact, he listens expecting something of value, regardless of its source and no matter how poorly expressed.

I don't think there can be any question that attentive, patient, nonpaternalistic and openminded listening, free from consciousness of self and rank distinction, is the biggest single factor in leadership.

A short while back I went through a bang-up, spick and span foundry pouring a lot of iron into very fine castings, with excellent finish. Housekeeping was super; Cupola loading and melting was the best; the sand system was excellent; the routing rigging and equipment was A1, and

What's a

a SPOMATIC, daddy?

"A SPOMATIC, son, is a big machine. It makes sand molds... just like you're doing. But it makes hundreds in an hour. And it does it all day long... all automatically. Another fellow and I run one at the foundry. It's easy!

"Actually, it is more than just a machine. It's a whole new system in itself. This one machine... this SPOMATIC... does more work in one day than a dozen ordinary machines. That's why my boss says it is the biggest money-maker in the business.

"Try to beat the SPOMATIC's performance if you want to, son, but remember... *there isn't a foundry molding machine in the world that can!*"

WORLD'S LARGEST SUPPLIERS OF MOLDING MACHINES

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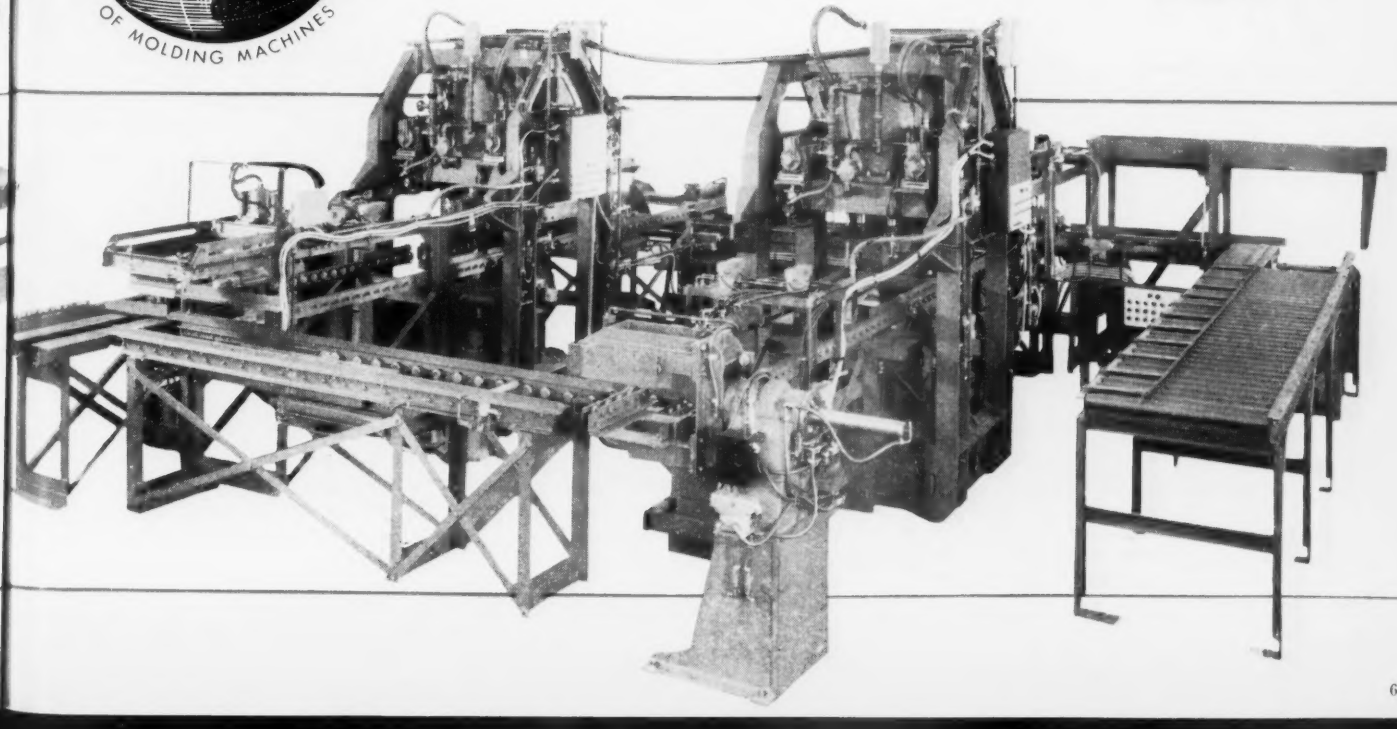


6653-5

there was a good work tempo all through the place. But it sure was noisy. There were many questions I would have liked to ask my host, but after getting hoarse trying, I gave up.

The quietest of foundries, of course, are well over the decibel hump on the noisy side; in fact, we are inclined to take noise for granted. Even so I couldn't help but think that the development of better employee relations through the art of leadership listening would have pretty rough sledding in such a din. Man-to-man chats in competition with tumbling mills, snagging wheels, vibrators, air chippers, molding machine exhausts, jolts, blowers and other such stuff would be pretty much a one-sided affair.

Smoke, dust, dirt and salamanders used to be taken for granted. As time goes on, I betcha noise will get its comeuppance too, and foundry followers will get better acquainted with their leaders. Then the art of listening will pay off in terms of good feelings and production.

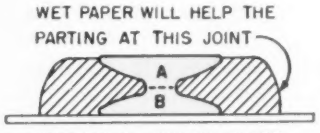
Book Review

Dimensional Motion Times, by H. C. Geppinger, 100 pp., 8½ x 11 in. published by John Wiley & Sons Inc., New York. Price $4.

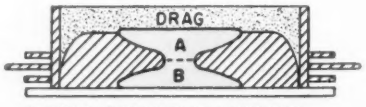
The first booklength report of this new form of motion time study relies fully on facts—that is, dimensions—and avoids human judgment and descriptive definitions. Since its time values, relating to dimensions, are self-contained, complete and final, no adjustments or buildups by the analyst are necessary.

To clarify the system, the book makes available concise terms for specifying and recording work details by motions and for predetermining the necessary manual time of operations by motion times. The author provides a set of terms by which uniformity of analysis and measurement is said to be assured. He also includes complete examples of application and describes how motion times are affected by engineering, methods and material changes.

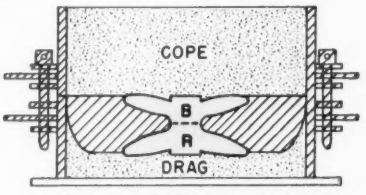
HOW TO DO IT



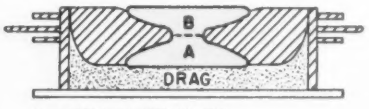
1 PATTERN IS LAID ON PLATE AND SLIP JOINT MADE



2 DRAG IS PLACED IN POSITION AND RAMMED UP

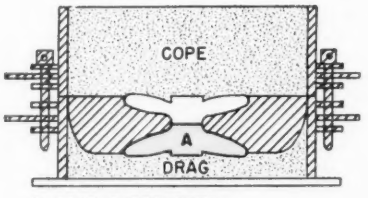


3 DRAG IS TURNED OVER AND COPE PLACED IN POSITION AND RAMMED UP

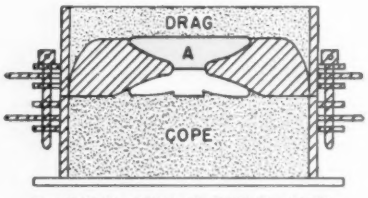


4 COPE IS REMOVED

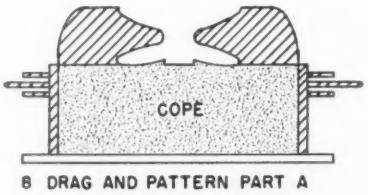
5 PATTERN PART B IS REMOVED



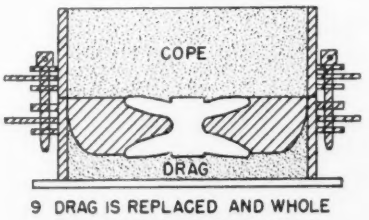
6 COPE IS REPLACED



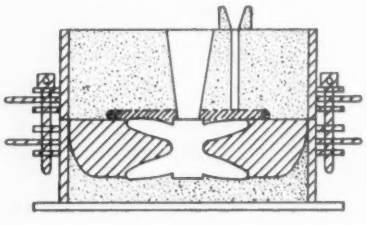
7 WHOLE MOLD IS TURNED OVER

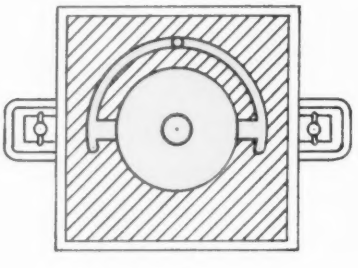


8 DRAG AND PATTERN PART A ARE REMOVED



9 DRAG IS REPLACED AND WHOLE MOLD IS TURNED OVER AGAIN


10 COMPLETED MOLD WITH RUNNERS AND RISERS READY FOR POURING


11 PLAN OF RUNNER SYSTEM

Do you have any tricks of the trade tucked away with your foundry experience? Why not release them to fellow foundrymen? FOUNDRY will pay a minimum of $15 for each idea submitted and published. Send a photo or drawing with your idea

Split Pulley Wheel Can Be Made In Two Parts Instead of Three

By LEONARD H. AKERMAN
Foreman
Kent Alloys
Rochester, Kent, England

MOLDING steps involved in casting a split pulley wheel in two parts are shown here. Cross-hatched and dotted areas show green sand, and the pattern is shown in color. The section of sand indicated by cross-hatching can be reinforced with wires or rods, if considered necessary, in making larger size pulleys.

Castings up to 12 in. in diam have been made successfully by this method. The runner system shown has been used for aluminum, iron, gun metal and aluminum bronze. The job can be run from the bottom or poured down the riser at the option of the molder.

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COLD SETTING BINDER ... *for castings of any size*

No Ramming

50% Less Rodding

Reduced Baking Time

Controlled Set Time

Rough Cleaning Eliminated

Accurate Core Sizes

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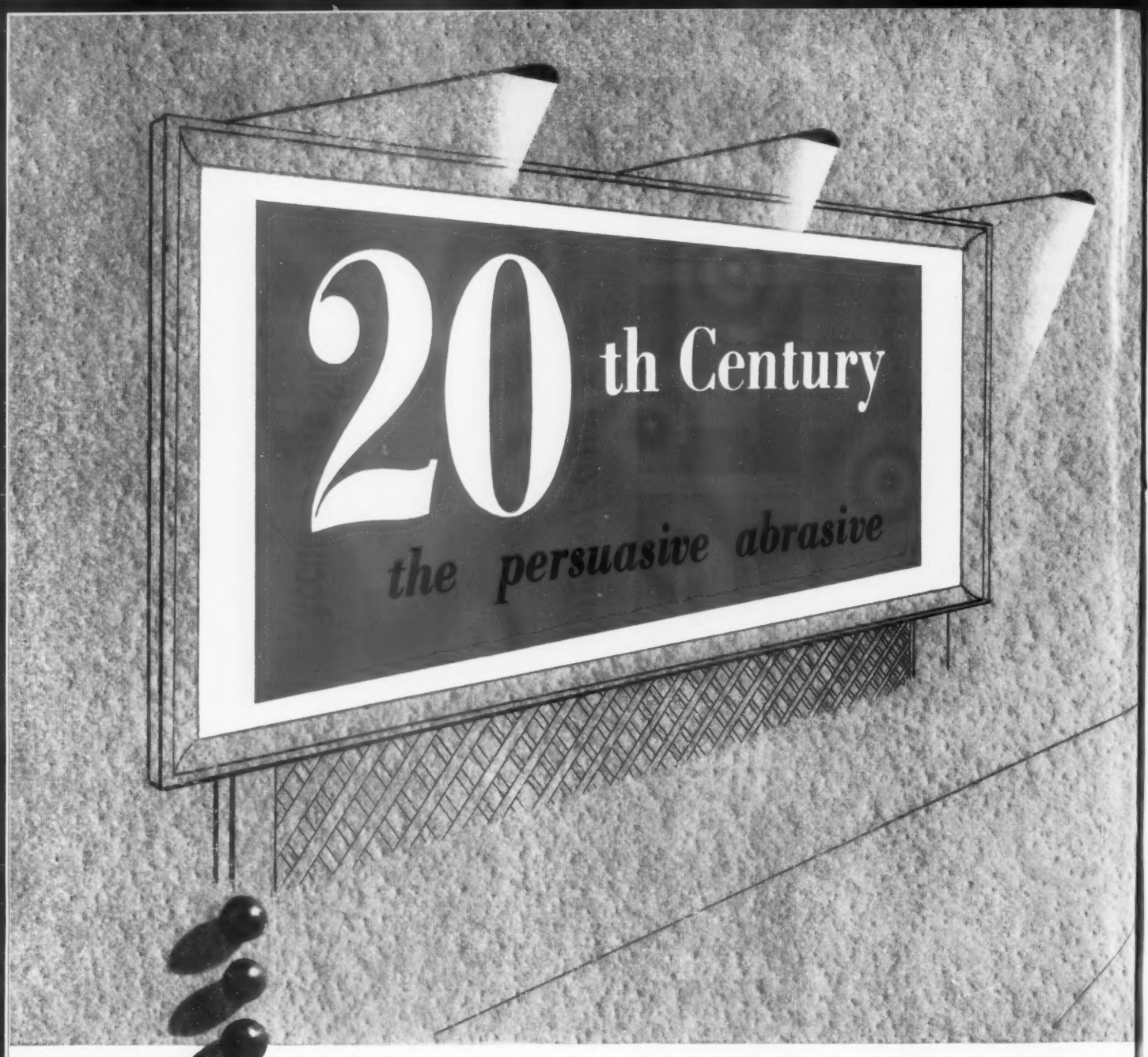

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It's your assurance of premium quality metallic abrasives for any cleaning or peening requirement. Choose our *Normalized line, for example, which lasts as much as four times longer than other abrasives. Or our Toledo Realsteel, produced in our new Toledo Steel Shot Division, for consistently high uniformity.

Remember, when you buy 20th Century, you buy top performance.

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One of the world's largest producers of quality shot and grit — Hard Iron — Malleable (*Normalized) — Cut Wire — Cast Steel (Realsteel)

*Copyrighted trade name

Foundry Statistics

MALLEABLE IRON

(Shipments of castings—net tons[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1953	970,506	578,749	.....
1954			
Nov.	70,030	41,609	80,686
11 mo.	741,417	412,977	.....
Dec.	80,599	49,005	85,064
Total	812,016	461,982	.....
1955			
Jan.	82,028	48,000	99,817
Feb.	85,979	48,721	101,766
Mar.	102,364	60,063	99,730
Apr.	101,226	57,397	104,091
May	98,397	57,317	106,446
June	99,456	60,261	107,559
July	75,570	44,914	115,420
Aug.	82,448	48,126	123,473
Sept.	87,215	55,471	116,636
Oct.	90,866	53,804	121,261
Nov.	99,280	58,069	116,981
11 mo.	1,004,829	592,143	.....

ALUMINUM

(Shipments of castings—1000 pounds[1])

	Shipments				Unfilled Orders[2]
	Total	Sand	Perm. Mold	Die	
1953	658,022	214,553	200,025	239,330	.....
1954					
Nov.	56,066	12,934	20,396	22,137	94,491
11 mo.	560,928	144,720	187,379	219,274	.....
Dec.	64,045	13,753	23,629	26,017	99,556
Total	624,973	158,473	214,408	245,291	.....
1955					
Jan.	64,414	13,358	23,679	26,819	102,382
Feb.	66,869	13,579	24,319	28,234	108,939
Mar.	78,958	16,019	29,029	33,229	110,046
Apr.	73,049	14,041	28,028	30,208	109,156
May	71,691	14,235	25,597	31,243	104,984
June	68,473	14,920	24,682	27,939	102,799
July	55,033	11,716	21,006	21,656	101,024
Aug.	64,864	14,916	22,267	27,004	105,994
Sept.	67,069	14,769	23,075	28,532	111,696
Oct.	72,197	14,485	25,135	31,741	120,222
Nov.	75,065	14,327	26,267	33,852	126,954
11 mo.	757,682	156,365	273,084	320,457	.....

COPPER-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments			Unfilled Orders[2]
	Total	Sand	Perm. Mold	
1953	990,496	888,369	61,316	.....
1954				
Nov.	70,020	63,065	4,089	27,608
11 mo.	763,509	688,020	44,502	.....
Dec.	72,421	65,159	4,346	32,054
Total	835,930	753,179	48,848	.....
1955				
Jan.	72,233	64,540	4,678	30,864
Feb.	75,253	67,768	4,598	37,520
Mar.	92,149	83,149	5,649	42,940
Apr.	84,183	75,903	5,152	51,111
May	85,008	76,064	5,513	49,198
June	90,476	80,869	5,840	45,820
July	65,816	59,138	3,998	48,085
Aug.	87,206	77,721	5,322	51,251
Sept.	89,600	80,481	5,603	57,313
Oct.	91,192	82,958	4,513	56,751
Nov.	90,345	80,934	5,807	57,049
11 mo.	923,461	829,525	75,833	.....

MAGNESIUM

(Shipments of castings—1000 pounds[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1953	34,517	31,469	.....
1954			
Nov.	2,161	1,906	6,867
11 mo.	23,490	20,919	.....
Dec.	2,287	1,906	6,678
Total	25,777	22,950	.....
1955			
Jan.	2,305	2,067	7,236
Feb.	2,160	2,009	7,376
Mar.	2,572	2,311	7,011
Apr.	2,633	2,405	6,800
May	2,399	2,174	6,530
June	2,367	2,098	6,346
July	1,920	1,763	5,912
Aug.	2,176	2,002	5,964
Sept.	2,478	2,260	5,670
Oct.	2,302	2,077	5,394
Nov.	2,325	2,148	5,805
11 mo.	25,637	23,314	.....

PRODUCTION WORKERS

Estimated Number

(Thousands)

	Nov. 1955	Oct. 1955	Nov. 1954
Ferrous	225,500	222,200	181,400
Nonferrous	76,500	73,800	65,700

Average Weekly Earnings

Gray Iron	88.37	87.96	76.02
Malleable Iron	85.90	82.82	78.60
Steel	93.51	93.51	75.60
Nonferrous	88.60	91.14	84.85

Average Weekly Hours

Gray Iron	42.9	42.7	39.8
Malleable Iron	41.9	41.0	40.1
Steel	42.7	42.7	37.8
Nonferrous	41.4	42.0	40.6

Labor Turnover Rate (Nov.)

(Per 100 employees)

	Total Accession	Total Separation	Quit	Layoff
Gray Iron	4.4	2.9	1.6	0.7
Malleable Iron	3.6	2.9	1.9	0.2
Steel	4.7	2.7	1.8	0.2
Nonferrous	4.0	3.3	1.7	0.6

Source: Bureau of Labor Statistics

GRAY IRON CASTINGS—SHIPMENTS (Net Tons[1])

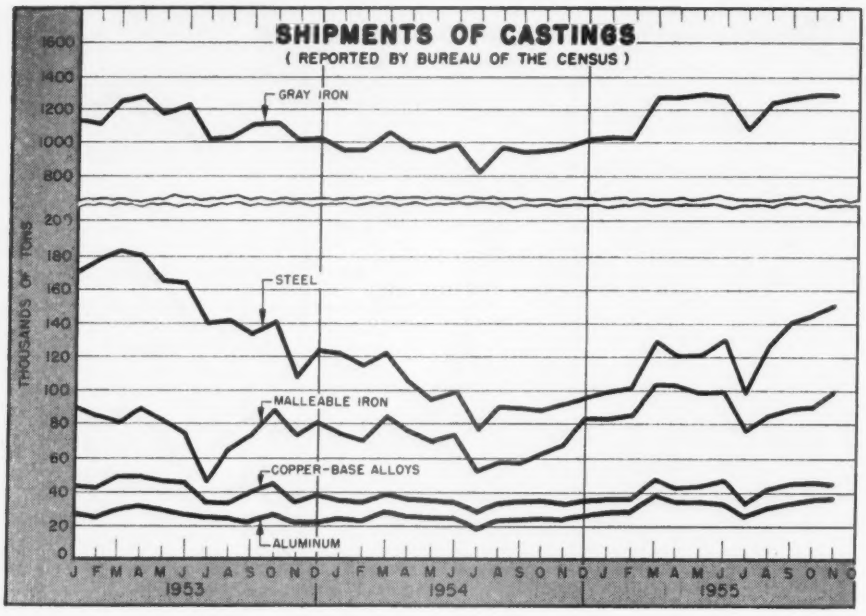
	All Castings		Miscellaneous Castings		Heavy Steel Ingot Molds		Chilled Railroad Car Wheels	Pressure Pipe & Fittings	Soil Pipe & Fittings	Unfilled Orders[2]
	Total	For Sale	Total	For Sale	Total	For Sale	Total	Total[3]	Total[3]	
1953	13,707,902	7,494,843	8,449,837	3,675,454	2,829,159	1,389,483	467,142	1,285,598	677,166	.....
1954										
Nov.	997,301	547,447	623,390	258,933	167,983	85,703	25,723	118,480	61,725	759,613
11 mo.	10,457,897	5,759,290	6,611,592	2,788,841	1,584,581	745,963	308,630	1,548,496	724,518	.....
Dec.	1,074,258	563,699	680,700	276,045	200,004	97,936	27,229	111,082	55,203	744,633
Total	11,532,158	6,322,989	7,292,292	3,064,886	1,784,625	843,899	325,859	1,376,671	743,721	.....
1955										
Jan.	1,091,923	563,153	712,097	282,386	192,132	97,007	25,783	100,638	61,273	782,656
Feb.	1,106,165	578,171	720,304	291,675	196,118	99,794	27,401	95,285	67,057	852,168
Mar.	1,314,918	688,733	847,874	334,287	217,571	109,681	36,732	129,746	82,995	934,224
Apr.	1,293,678	679,867	819,872	319,149	216,116	108,490	35,415	145,871	76,404	966,057
May	1,310,424	707,105	803,897	315,072	227,236	117,915	35,966	168,772	74,553	937,949
June	1,296,196	715,862	793,067	327,520	228,044	117,727	43,807	147,351	83,927	981,918
July	1,069,711	579,122	634,869	246,297	210,130	112,137	28,181	129,191	67,340	1,049,565
Aug.	1,226,312	688,317	718,423	301,502	238,007	121,071	29,298	156,074	84,510	1,160,466
Sept.	1,252,736	712,688	731,073	314,223	244,199	124,811	29,953	165,332	82,179	1,150,933
Oct.	1,310,309	713,671	795,875	327,827	245,749	122,722	31,877	160,875	75,923	1,113,336
Nov.	1,305,633	696,523	797,854	327,580	262,506	127,739	29,795	148,560	66,918	1,061,546
11 mo.	13,578,005	7,323,212	8,375,205	3,387,518	2,477,808	1,259,094	354,208	1,547,695	823,122	.....

STEEL CASTINGS—SHIPMENTS (Net Tons[1])

	All Castings			Carbon			Alloy			Unfilled Orders[2]
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	
1953	1,834,197	1,400,013	321,010	1,276,729	959,493	293,491	557,468	417,148	27,519	.....
1954										
Nov.	87,659	64,812	7,742	56,057	40 085	6,624	31,602	24,727	1,118	175,715
11 mo.	1,090,549	810,315	123,592	739,854	534,842	109,840	350,705	276,217	14,070	.....
Dec.	93,547	69,843	12,489	62,967	45 632	10,469	30,841	24,211	1,245	179,148
Total	1,184,096	880,158	135,581	802,321	580,474	120,309	381,285	303,428	15,315	.....
1955										
Jan.	98,238	75,044	13,809	67,307	49,816	12,762	30,841	25,228	1,047	201,839
Feb.	106,430	80,729	16,501	74,709	55,014	15,381	38,945	25,715	1,120	202,301
Mar.	127,460	98,926	19,339	88,867	68,013	17,887	34,933	30,913	1,452	215,059
Apr.	120,053	92,237	16,646	84,247	63,244	15,163	35,806	28,993	1,483	221,336
May	122,465	92,713	16,810	85,950	63,182	15,335	36,515	29,531	1,475	225,302
June	133,887	102,457	19,591	93,417	69,986	17,979	40,470	32,471	1,612	251,416
July	97,875	71,170	11,631	68,094	48,140	10,666	29,781	23,030	965	354,628
Aug.	126,406	96,290	20,576	91,245	68,514	19,094	35,161	27,776	1,482	413,531
Sept.	140,843	107,622	23,594	100,775	76,156	21,991	40,068	31,466	1,603	420,616
Oct.	145,674	110,409	23,745	105,345	79,235	22,375	40,329	31,831	1,370	418,063
Nov.	152,381	116,908	25,635	111,517	84,064	24,050	40,810	33,518	1,585	453,113
11 mo.	1,371,712	1,044,505	207,877	971,473	725,364	192,683	403,659	320,472	15,194	.....

[1]Source: Bureau of Census. [2]For sale only. [3]All cast iron pipe is shipped for sale.

FOUNDRY STATISTICS



COMMERCIAL HEAT TREATING

(National Billings of Metal Institute Members)

	1953		1954		1955	
	No. Reporting	Total Reported	No. Reporting	Total Reported	No. Reporting	Total Reported
Aug.	60	2,452,186	62	1,801,659	64	2,439,300
Sept.	57	2,522,127	63	1,853,665	63	2,581,000
Oct.	59	2,782,219	63	1,891,100	63	2,785,100
Nov.	59	2,493,497	63	1,932,700	63	2,809,100
Dec.	57	2,219,406	63	2,057,500	63	2,786,600
Annual total		31,733,067		24,590,500		29,601,200

COKE PRODUCTION AND CONSUMPTION

(Net tons)

	Production	Consumption Total	Consumption By Foundries
1953	78,467,806	78,227,414	2,915,420
1954			
Nov.	5,230,237	5,283,916	221,391
11 mo.	53,916,159	53,523,931	2,262,822
Dec.	5,610,564	5,615,228	217,104
Total	59,526,723	59,139,159	2,479,926
1955			
Jan.	5,805,926	5,862,113	234,784
Feb.	5,394,166	5,519,241	242,282
Mar.	6,235,909	6,306,723	286,072
Apr.	6,135,645	6,164,459	278,242
May	6,426,747	6,570,567	277,967
June	6,148,026	6,297,338	249,525
July	6,169,770	6,266,631	221,372
Aug.	6,395,422	6,439,101	249,425
Sept.	6,397,133	6,501,013	260,608
Oct.	6,630 609	6,813,118	283,818
Nov.	6,537,397	6,571,253	285,645
11 mo.	68,276,750	69,311,557	2,869,740

INGOT BRASS AND BRONZE

(Shipments in net tons)

	1954	1955
Jan.	20,661	25,201
Feb.	19,920	25,349
Mar.	23,653	29,713
Apr.	24,746	27,641
May	22,269	23,708
June	22,348	23,141
July	17,074	18,513
Aug.	21,684	27,013
Sept.	22,464	26,349
Oct.	24,080	25,228
Nov.	23,061	25,102
Dec.	21,273	21,448
Total for year	263,233	298,406

ZINC-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments Total	Shipments For Sale	Unfilled Orders[2]
1953	521,253	349,022	.....
1954			
Nov.	51,990	35,207	62,950
11 mo.	466,091	287,634	.....
Dec.	54,410	35,211	69,603
Total	520.501	322,845	.....
1955			
Jan.	58,586	35,472	70,691
Feb.	58,585	35,893	73,858
Mar.	71,811	44,048	81,363
Apr.	71,595	45,477	81,756
May	63,735	38,124	74,472
June	66,569	42,753	71,344
July	47,928	27,429	68,927
Aug.	62,677	61,957	75,592
Sept.	62,030	43,498	80,660
Oct.	71,689	46,581	85,489
Nov.	75,099	47,572	93,001
11 mo.	710,304	468,804	.....

INDEX OF FOUNDRY EQUIP. ORDERS

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1954	1955
Jan.	173.8	81.0
Feb.	99.9	90.4
Mar.	82.7	163.6
Apr.	125.3	178.6
May	80.8	145.7
June	86.4	186.8
July	68.8	213.4
Aug.	75.6	134.0
Sept.	68.3	156.7
Oct.	147.5	108.6
Nov.	61.4	154.4
Dec.	113.9	....

Note: Figures are percentages of the base period 1947-49 taken as 100 per cent (monthly average). This is a new base period. Source: Foundry Equipment Manufacturers Association.

IRON AND STEEL SCRAP CONSUMPTION

(Gross tons*)

	All Scrap Total	By Types of Furnace: Cupola Total	Air Total	Electric Total
1953	69,005,976	9,676,463	1,026,334	8,263,880
1954				
Oct.	4,782,488	710,127	67,678	528,432
10 mo.	44,776,345	7,006,860	690,453	4,960,923
Nov.	4,928,850	737,286	71,844	573,298
Dec.	5,075,563	798,435	82,910	566,223
Total	54,780,758	8,542,581	855,207	6,100,444
1955				
Jan.	5,416,052	813,682	90,622	614,824
Feb.	5,350,452	823,465	91,916	577,296
Mar.	6,313,717	993,266	113,198	727,401
Apr.	6,239,036	975,751	108,965	726,138
May	6,415,947	963,082	109,074	745,060
June	6,117,573	928,908	116,419	733,573
July	5,447,130	730,735	81,216	623,623
Aug.	5,913,031	868,644	101,607	765,343
Sept.	6,060,491	881,158	119,550	753,318
Oct.	6,443,349	944,685	113,411	820,642
10 mo.	59,716,778	8,923,376	1,045,978	7,087,218

PIG IRON PRODUCTION AND CONSUMPTION

	Production** (standard grades—net tons)					Consumption* (By type of furnace—gross tons)			
	Total	Foundry	Malleable	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Total	Cupola	Air	Electric
1953	74,879,511	2,599,307	3,736,431	60,465,016	8,347,825	66,637,364	4,918,480	272,311	164,267
1954									
Dec.	5,526,720	229,717	259,423	4,510,772	526,808	4,978,200	403,726	19,829	13,917
Total	58,113,924	2,241,436	2,798,646	47,485,047	5,587,465	52,373,541	4,364,418	215,158	155,258
1955									
Jan.	5,729,404	243,608	272,451	4,703,875	509,470	5,202,360	409,281	18,874	20,016
Feb.	5,394,585	209,852	252,860	4,425,080	506,793	4,964,515	409,141	20,576	22,551
Mar.	6,406,902	221,437	359,413	5,239,116	586,936	5,830,943	480,639	24,066	15,931
Apr.	6,329,927	210,085	305,188	5,068,506	746,148	5,725,258	467,709	21,536	12,857
May	6,753,236	246,661	342,544	5,385,299	788,732	6,044,882	471,657	21,448	20,085
June	6,494,838	238,412	347,631	5,245,861	662,934	5,774,896	454,751	22,871	21,697
July	6,329,393	233,235	344,365	5,116,960	634,833	5,430,550	361,171	16,483	19,535
Aug.	6,529,580	251,459	319,951	5,214,901	743,269	5,769,689	442,532	22,014	25,685
Sept.	6,653,578	252,630	343,919	5,397,134	659,895	5,903,190	445,099	23,340	24,552
Oct.	6,905,280	267,405	315,045	5,647,527	675,303	6,193,512	470,610	22,659	23,328
Nov.	6,636,649	241,727	353,713	5,404,584	636,625	.....	.....	.....	.....
Dec.	6,887,667	242,446	329,607	5,660,307	655,307	.....	.....	.....	.....
Total	77,114,073	2,858,957	3,884,971	62,570,394	7,799,751	.....	.....	.....	.....

*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only.

in

SHELL MOLDING

there's one great name

SHELL PROCESS, Inc.

on four great machines!*

These are the most efficient and universally accepted shell molding machines and allied equipment in the world today:

1. SHELL PROCESS automatic 2-station Shell Molding Machine, the 'Chicopee Twin'.
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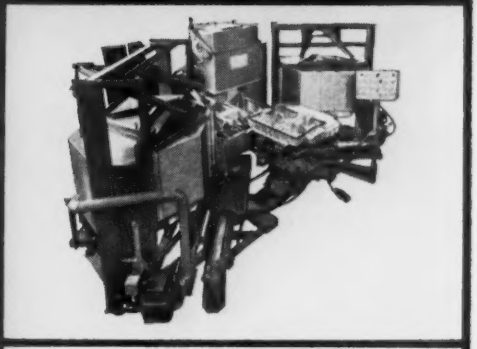
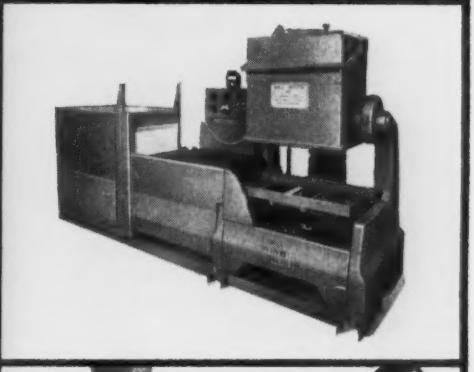
3. SHELL PROCESS automatic shell bonding fixture.
4. SHELL PROCESS core Blower, 'Chicopee Core Chief'.

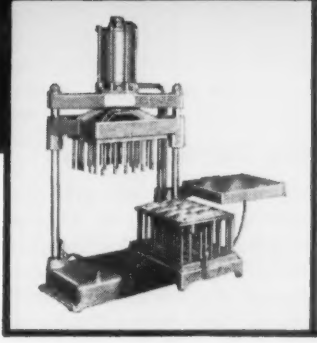
Optional equipment available to further automate the Shell Molding process.

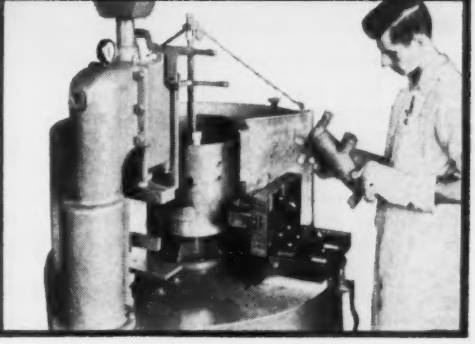
Complete Shell Pattern making facilities. Standard pattern plates, ejector pins and locator buttons.





For information and descriptive literature write today and make plans now to see these great shell molding machines at the Foundry Show, Atlantic City, May 3–9, 1956. Booths 1312, 1314, 1316.





SHELL PROCESS, INC.

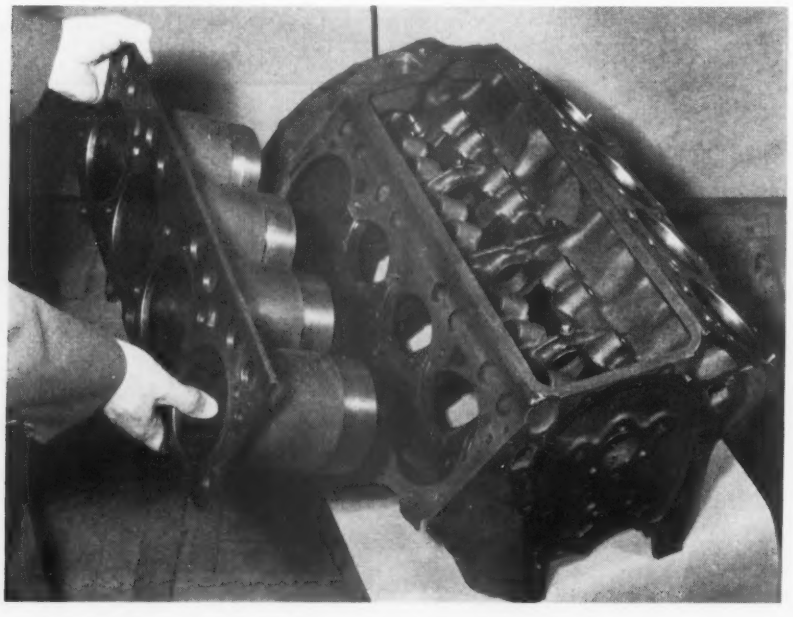
Manufacturers of Shell Molding Machines and allied equipment

361 McKinstry Ave., Chicopee, Mass.

Foundry Developments

By EDWIN BREMER
Metallurgical Editor

NEW and reportedly less expensive method of manufacturing automobile engine blocks has been developed by Perfect Circle Corp., Hagerstown, Ind. As shown in the accompanying illustration, the working cylinders and top deck are made separately from the block, thereby reducing the costly coring employed in the conventional method. The cast iron cylinders used are centrifugally cast and then silver-brazed to a flat steel top deck. The top deck is sealed on the block casting by a paper-neoprene gasket and the lower ends of the cylinders are sealed by rubber rings where they pass into the crankcase. Among advantages claimed for this method of construction are: Use of softer iron in the block for more rapid machining; use of better material for cylinders; close control of wall thickness; reduction of leaks and other defects in blocks.



For Rapid Annealing

INCLUSION of high sulphur content in iron for production of malleable iron which can be rapidly annealed is described in a recent German patent No. 935,794. Composition is indicated as 2.5 to 3.5 per cent carbon, 1.5 to 3 per cent silicon, 0.3 to 0.5 per cent sulphur, 0.5 per cent max. manganese, and 0.15 per cent max. phosphorus. It is claimed that heating at 950° C (1742° F) for one hour produces a material with a pearlitic matrix with the graphite in knotty as well as ball form. Tensile strength of the iron ranges from 57,000 to 85,000 psi, and the elongation from 3 to 10 per cent.

High-Temperature Alloys

INVESTIGATIONS in development of cast and forged alloys for high-temperature applications is described in a report recently released by the Office of Technical Services, U. S. Department of Commerce, Washington 25. Studies were conducted on wrought Fe-base, the D-183 type, and both wrought and cast Co-base alloys. A heat treatable, Fe-base, austenitic alloy containing Mn and Cr was modified with B to give excellent stress-rupture results at 1200° F. Outstanding rupture properties of D-183 were obtained with 20 per cent B addition. Report is PB 111891, "Development of Wrought and Cast Alloys for High-Temperature Applications," and available for $2.50. Contains 93 pages and is illustrated.

Study Titanium Alloys

EFFECTS of various production elements on various properties of titanium and its alloys are described in three reports just released by the Office of Technical Services, Department of Commerce, Washington, 25. Properties studied include tensile, impact, microstructure, hardness, bend, fatigue endurance, etc. Reports are as follow: "Structural Changes of Commercial Titanium and Titanium-base Alloys on Heat Treatment," Report No. PB 111767, price $3.25. "The Effect of Grain Size on the Mechanical Properties of Titanium and Its Alloys," Report No. 111881, price $3.75. "Tensile Properties and Rheotropic Behavior of Titanium Alloys and Molybdenum," Report No. 111898, price $3.50.

Speeds Cooling Rate

APPLICATION of silicon carbide bricks and blocks as denseners in production of certain types of gray iron castings is described in an article, "Silicon-Carbide Shapes as Denseners in the Foundry," by H. W. Griffiths in the Jan. 19 issue of *Foundry Trade Journal* (London). Advantages claimed are that no fusion tendency occurs, machinable surface on casting, rust resistance and long life.

Micrographs in Color

METHOD of obtaining photomicrographs in color is described by P. Levesque and R. Mroczek, Raytheon Mfg. Co., Waltham, Mass., in an article, "Color in Metallography," in the winter (February) issue of *The Educational Focus* published by Bausch & Lomb Optical Co., Rochester, N. Y. The authors found that a tungsten ribbon filament formed an excellent source of illumination. Exposure times are ascertained with an electronic photometer. A table of typical exposures for several metals and alloys is included.

Measures Oxygen Content

ACCORDING to Leeds & Northrup Co., Philadelphia, a new gas sampling system has been developed for use with its magnetic-type oxygen analyzer to ascertain the oxygen content of open-hearth flue gases for obtaining efficient combustion. Sampling unit has an outer water-cooled jacket housing the gas collecting tube. Another tube in the center sprays filtered water through openings at the end of the gas collecting tube to keep it free from slag.

BASIC NEWS
FOR CUPOLA OPERATORS

Basic Refractories offers field service to foundries

Cupola operators interested in adopting a basic practice can get maintenance information and assistance from Basic Refractories' engineers. These men know refractory application and are familiar with cupola practice.

BASIC CUPOLA OPERATION MEANS BETTER POURING CHARACTERISTICS

Operators of basic lined cupolas find that metal produced with basic slag systems has superior pouring characteristics.

Basic melted iron is usually more fluid than acid iron at the same temperature and of equivalent carbon. This is believed due to the higher carbon-to-silicon ratio generally found in basic melted iron. *The result can be less scrap castings.*

Higher metal tap temperatures

Basic slags have a constant cleansing action on coke ash in the cupola. New surfaces of carbon are always exposed for combustion and absorption by the molten metal. Higher metal tap temperatures and a smoother operation result from this slagging action.

Basic linings for cupolas offer 8 advantages

Costs of Basic linings are higher than acid. But these costs are offset by the following advantages:

1. **Lower sulphur content in the iron produced.**
2. **Greater carbon pickup.**
3. **Higher metal tap temperatures.**
4. **Use of lower cost charges.**
5. **Absence of bridging and clean drop.**
6. **Better pouring characteristics of metal.**
7. **Less scrap castings.**
8. **Steel scrap can be substituted for low phosphorous pig iron without lowering the total carbon content of the iron.**

Most basic cupola operators realize a 10% to 15% melting rate increase. Absence of bridging and clean drop are other advantages offered by basic operation.

BRI Gun—Gundol have many advantages for cupola maintenance

The BRI Gun—first gun specifically designed for refractory emplacement—offers many advantages. It handles either basic or acid refractories and reduces to a few minutes work the making of a dense, monolithic repair. The "laying up" of brick, with resulting joints subject to chemical and physical erosion, is eliminated.

Gundol, used in combination with the BRI Gun, is highly recommended to the basic cupola operator for maintenance. The high magnesium and calcium oxide content of Gundol is refractory and resistant to basic slags. Controlled sizing and added chemical bonds cause the refractory to adhere well when gunned in place.

Using BRI Gun to install basic cupola lining

BASIC REFRACTORIES INCORPORATED

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REFRACTORIES ENGINEERING AND SUPPLIES, LTD.—EXCLUSIVE CANADIAN AGENTS

For more information, use Reader Service Card, page 201

Around the Country

NEWS REPORTS FROM

Chicago . . . New York . . . Pittsburgh . . . Los Angeles . . . Philadelphia

Chicago— High price of scrap during the last six months bore down heavily upon foundries. As a consequence, they found it economical to use the maximum amount of pig iron in their melts. To illustrate, Chicago prices for scrap in January, this year, compared with January, 1955, increased as follows: No. 1 cupola cast—27 per cent; No. 1 machinery cast—26 per cent; and 18-inch and 2-foot rails—36 and 37 per cent, respectively. No. 2 foundry pig iron, on the other hand, advanced only 5 per cent during the same period.

Of course, what happened to foundry scrap also happened to steelmaking scrap, so that mills found it expeditious to use the maximum ratios of hot metal in open-hearth furnace charges.

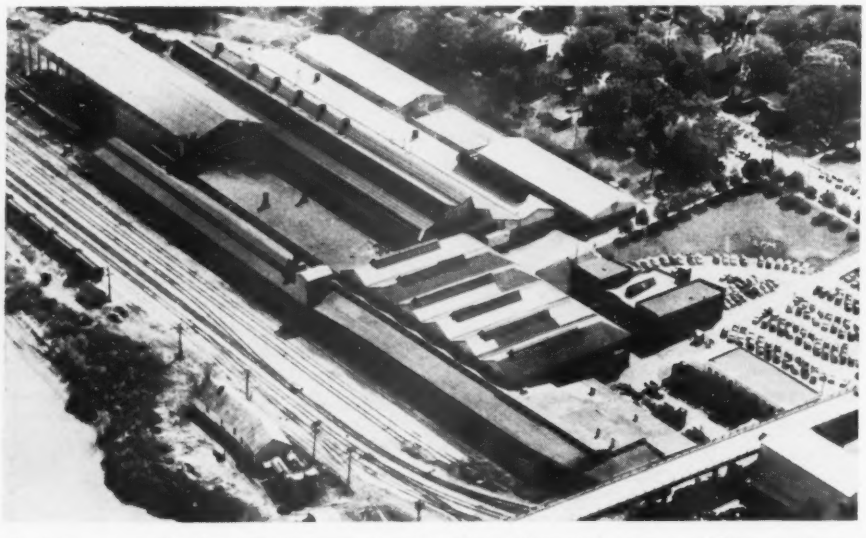
Thus, steelmaking and foundry demand for iron combined to keep blast furnaces operating at a high level in 1955. The year started with 36 of the 43 furnaces in the Chicago district active and ended with 41 in blast. In seven months of the year 41 operated, until by January, this year, full capacity operations were attained.

From all indications, blast furnaces are going to be kept pretty busy in 1956. Steelmaking is establishing all-time production records and there is strong demand for pig iron by foundries. No shortage of iron is anticipated this year, although several blast furnaces must be idled for relining and repairs during coming months.

Chicago district blast furnace capacity increased 399,450 tons last year to 15,743,500 net tons on Jan. 1, 1956, according to the American Iron and Steel Institute. This carries no significance to foundries, however, because 372,250 tons of the gain was by Inland Steel Co. and 27,200 tons was by the Gary Works of United States Steel Corp.—and the end use will be to support steelmaking. The capacity of merchant iron facilities in the district stands unchanged.

* * *

Because of the continuing shortage of copper and its high scrap value, nonferrous foundries in this area are still targets of thieves seeking copper-bearing alloys or equipment. Most recent theft here occurred at Chicago White Metal Castings Inc., Chicago, where 100 bronze molds weighing nearly three tons were stolen. The molds, valued at $20,000, were used for making lamps and novelties.



Aerial view of plant of Locomotive Finished Materials Co., Atchison, Kans., which has been acquired by Rockwell Mfg. Co., Pittsburgh. Steel casting and machining facilities at LFM reportedly are largest west of Mississippi River

Pittsburgh— Rockwell Mfg. Co., Pittsburgh, has acquired assets of Locomotive Finished Materials Co., Atchison, Kans., a company which owns one of the largest steel foundry and machining facilities in the West. That firm will continue under its present management as a major division of Rockwell.

Rockwell officials say the foundry will continue to serve its regular customers in the same manner as before. The acquisition gives Rockwell needed capacity in the Midwest.

Slowdown in automotive orders at steel mills in this area doesn't affect foundries to the same degree. Pittsburgh area foundries haven't depended on automotive orders, as they enjoy substantial demand from steel mills. Gray iron foundries continue to operate near capacity, with a fair backlog of orders.

The upward movement in scrap price worried local foundries early this year. Now the rise appears to be halted, foundrymen hopefully report. Scrap prices apparently reached their highest point with capacity steel operations of early January.

New York—Nonferrous foundries are operating at a full 100 per cent of normal, compared with 80 per cent for gray iron shops and perhaps 80 to 85 per cent for what steel casting capacity remains in this area. The district's limited malleable capacity is close to 100 per cent.

Demand for meters, plumbing supplies and industrial pumps and valves is contributing greatly to nonferrous business. Adding also is the growing maritime work, both navy and commercial and related mostly to repairs. The light metals are doing well. Aluminum casting production is going mostly into aircraft work, but there is still considerable activity in components for domestic dur-

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How NOT to get a bang out of rocket fuel powder

YOU can't see it—but super-dangerous rocket fuel powder is what's conveyed inside that spiralling tube. It used to be handled by screw conveyors and bucket elevators. Catch was that the powder sometimes came in contact with oil or grease, causing violent explosions.

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It's stainless-steel throughout, with totally-enclosed conveying tube. It's grounded, air-tight and self-cleaning. It vibrates the powder gently, quickly and safely to the top discharge where it's fed onto another Carrier Natural-Frequency Conveyor—a covered, horizontal unit that's also stainless-steel, air-tight and grounded. The whole operation is now quicker, cleaner and more efficient. Most important, of course, *danger has been minimized!*

Chances are that danger isn't the big headache in your operation. But whatever it is—if it involves handling and processing, Carrier Natural-Frequency Vibrating Equipment may be the answer. Remember — Carrier developed the world's first really modern vibrating equipment . . . knows more about its *practical* industrial applications than anyone else. May we talk with you soon?

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Whether the job is to strip a flask, lift a 1-ton casting on to a shakeout or handle a tote box in a hurry, the rugged Series "600" 'Load Lifter' Electric Hoist fills the bill. Capacities: ½ and 1 ton. All types of suspension. Ask your "Shaw-Box" Distributor for details or write us for Bulletin 408.

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able goods, such as washing machines, dryers and the like. Magnesium shops are busy on a diversity of casting requirements.

Gray iron shops specializing in machine tool work are operating at capacity, but those engaged in general jobbing work report business as being a bit spotty and say they are having some difficulty maintaining five days a week even with restricted forces. Gray iron backlogs average less than a month.

Sacks-Barlow Foundries Inc., Newark, N. J., forced into receivership Jan. 12, has been cleaning up on work already cast. However, there are indications that the plant may start melting again once bankruptcy proceedings have been cleared. The company produced gray iron and malleable castings, being one of the two malleable producers in the immediate area.

Los Angeles—Magnesium foundries are busier than at any time since the end of the Korean conflict. Aircraft plants are ordering new designs at a near-record rate, and magnesium shops are working six-day weeks with two shifts to handle the increased business. Most aircraft people say their requirements will continue at the accelerated rate for several weeks, possibly into late spring.

Steel and brass shops are almost equally busy, although some foundrymen complain that operating costs have climbed more rapidly than sales. Consequently, they say, sales must increase by approximately 10 per cent during the first quarter if profits are to equal that period of 1955. Labor costs have increased the most, although materials are a factor, some foundries spending as much as $50 for No. 1 cupola cast scrap.

Despite the inflated price of foundry scrap, most shops find it necessary to purchase in large quantities and build up inventories, rather than limit purchases to immediate needs. Orders are erratic, and no foundry wants to be caught short of supplies when unexpected orders are received.

Philadelphia— Gray iron foundry operations are active, but are leveling off. There are less overtime operations, with most shops working five days a week. However, production is being fairly sustained by an increase in working forces. Conservative estimates place average gray iron operations at 80 per cent of normal. Shops encountering most difficulty sustaining higher operating levels are those engaged in light squeezer machine work.

While it is off-season for construc-

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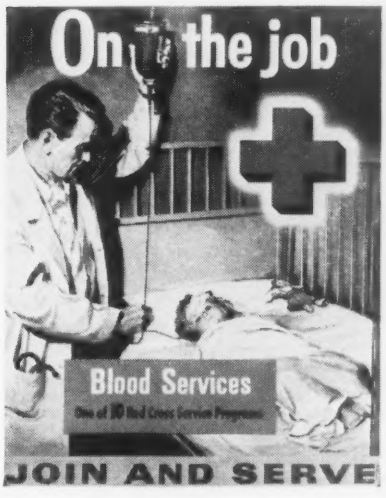
tion work, pipe shops generally are busy building up inventories for the spring demands. Agricultural equipment requirements are brisk, although not as active as anticipated, and auto die work is holding up well. Textile machinery work has eased. Backlogs at gray iron shops currently average a little better than four to five weeks.

A growing and more diversified demand is helping steel foundries. Most are operating at five days with full working forces and backlogs are creeping up, ranging perhaps four to six weeks. Malleable business continues very good. Hardware, pipe fittings and an increasing amount of railroad work are contributing to the activity.



Malleable operators' major difficulty is obtaining scrap. Reflecting stringency in this material prices are perhaps at an all-time high and are running several dollars a ton over pig iron prices. Scrap is badly needed, it is said, for metallurgical reasons. Gray iron shops also are having difficulty getting scrap at reasonable prices. Purchases of No. 1 cupola by an eastern Pennsylvania steel producer have tended to keep prices higher than otherwise might be the case.

Business with the brass and bronze shops is rather spotty. Most are able to operate five days a week, but with restricted working forces. Foundries specializing in marine work have been having rough going but are somewhat more encouraged by the outlook. New York Shipbuilding Corp., Camden, N. J., has recently booked three tankers, and in general there seems to be a slow but steady building up of ship requirements along the entire eastern seaboard.

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FEF NINTH ANNUAL CONFERENCE

To Be Held in Cleveland, Mar. 7-8

A RECORD attendance of foundry industry representatives and college foundry faculty is anticipated for the ninth annual College-Industry Conference of the Foundry Educational Foundation. The meeting will be held Mar. 7-8 at the Hotel Cleveland, Cleveland.

This year's conference will have a dual theme—"What's New in Cast Metals Engineering Education" and "The Meaning of Engineering and the FEF to Medium and Smaller Size Foundries."

Leading engineering educators and foundry industry executives have been selected to discuss specific applications of engineering to the daily operating problems common to all foundries. In this way, foundry executives can be brought up to date on latest engineering developments and on the practical applications of this technology at their own plants.

The annual banquet to be held Wednesday evening will be one of the conference high lights. Dr. Deane W. Malott, president of Cornell University, will be the featured speaker, discussing "The New Links Between Education and Industry."

The conference opens Wednesday at 10:30 a.m. At 9 a.m., meetings are scheduled for the FEF board of trustees, chairmen of the Industry Advisory Committees and the University Advisory and Technical Advisory Committees. Annual meeting and election of trustees of the FEF is scheduled for 3 p.m. Wednesday.

The panel discussion on "Application of Engineering in Foundries" will feature the Thursday morning program. Emphasis will be placed on actual experiences common to all foundries regardless of size, and discussion will cover the metallurgical, mechanical and industrial engineering aspects of operations.

Program details follow:

Wednesday, Mar. 7

8:30 a.m.—Registration

10:30 a.m.—Address of welcome: E. C. Hoenicke, president, Foundry Educational Foundation.

10:45 a.m.—University Activity: University of Alabama—"The Role of Engineering in Foundry Operation," W. C. Jeffery, associate professor, Metallurgical Engineering Department. University of Cincinnati—"The Co-op Student in the Medium Size Foundry," W. H. Tholke, instructor, Metallurgical Engineering Department, and "The Co-op Graduate in the Medium Size Foundry," Fred Westermann, assistant professor, Metallurgical Engineering Department. Cornell University—"Watching Metals Solidify," M. S. Burton, associate professor, School of Chemical and Metallurgical Engineering.

12 noon—Lunch. "The Economics of Foundry Engineering," C. V. Nass, Beardsley & Piper Division, Pettibone Mulliken Co., Chicago.

2 p.m.—University Activity: University of Michigan—"New Developments in Cast Metals—and the Foundry Engineering Student," R. A. Flinn, professor, Metallurgical Engineering Department. Missouri School of Mines—"The Meaning of Engineering Education and the Foundry Educational Foundation to the Medium and Small Size Foundry," D. S. Eppelsheimer, professor, Metallurgical Engineering Department. University of Wisconsin—"Thoughts on New Developments and Engineering Education in the Castings Field," R. W. Heine, associate professor, Mining and Metallurgical Department.

3 p.m.—Annual meeting: Foundry Educational Foundation, E. C. Hoenicke presiding.

4 p.m.—Trustees meeting, 1956-57.

6 p.m.—Reception, new officers. Banquet: Thomas Kaveny Jr., Herman Pneumatic Machine Co., Pittsburgh, presiding. "The New Links between Education and Industry," Dr. Deane W. Malott, president, Cornell University. Toastmaster, H. E. Helling Jr., Mathews Conveyer Co., Ellwood City, Pa.

Thursday, Mar. 8

9:30 a.m.—Recommendations of Committees.

10 a.m.—Panel: "Application of Engineering in Foundries," R. L. Gilmore, Superior Steel & Malleable Castings Co., Benton Harbor, Mich., presiding.

12 noon—Lunch.

1 p.m.—Comments by former Foundry Educational Foundation scholarship holders: Claridon J. Thomas, Michigan State '55—International Harvester Co., Chicago; Ray H. Witt, Case '52—Cadillac Malleable Iron Co., Cadillac, Mich.; Jack E. Bolt, Alabama '52—General Electric Co., Pittsfield, Mass.

2 p.m.—Film—"To Meet the Challenge," a new concept in foundry operation, James H. Smith, Central Foundry Division, General Motors Corp., Saginaw, Mich.

2:30 p.m.—Conference Summary and Recommendations, Prof. E. C. Wright, Department of Metallurgical Engineering, University of Alabama, presiding.

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Continuously Cast Bronze Made in 9-inch Diameter

BEARING BRONZE stock now is being continuously cast in sizes ranging from 7/16 to 9 in. in diam, in many foundry alloys and in a variety of shapes. Produced in the Continuous-Cast Products Dept. of American Smelting & Refining Co. at its Barber, N. J., plant, the stock is available in long lengths or in the exact lengths required by customers. Previous maximum diameter was 5 in.; 44 new sizes from 5 to 9 in. have been added.

In the company's process, molten bronze flows continuously into water-cooled graphite dies, freezes and emerges cast to size in the form of finished mill lengths. Only a minimum of machining is necessary since each ready-to-cut length is cast with a profile approximating the shape required.

The gravity-fed, bottom-flow casting method prevents trapping of dirt and dross, and, of course, there are no sand inclusions in continuous-cast products. Foreign matter floats on top of the melt, without turbulence to carry it into the product. Freezing from the bottom up permits escape of dissolved gases which could cause porosity. There are no blowholes or soft or hard spots.

By excluding impurities and using a superior rate of chill which improves dispersion of alloy con-

stituents, the continuous-casting process raises fatigue characteristics 33 to 100 per cent. Impact strength is increased 15 to 100 per cent, and other improvements are made in tensile and yield strength and hardness.

Five four-story-high vertical production lines operate around the clock seven days a week, and fork lift trucks keep material moving fast.

Illustration shows smallest and largest diameters of continuously cast bearing bronze produced to date. Rod is ½-in. and tube is 9 in. in diameter

The molten metal is furnished by batch melting in indirect arc electric furnaces. The casting furnace, which holds a 2500-lb melt, provides temperature control and deoxidation and, above all else, means for accommodating the die and supplying it continuously. Dies are machined from high-density graphite. Relatively inexpensive, they have an average life of 24 hours.

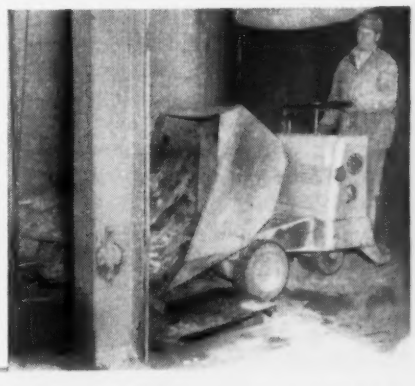
Power Crane and Shovel Association Elects Officers

Power Crane and Shovel Association held its annual meeting recently and elected the following officers for 1956: President, D. W. Lehti, president, Link-Belt Speeder Corp., Cedar Rapids, Iowa; vice president, M. B. Garber, vice president-sales Thew Shovel Co., Lorain, O. Directors elected to three-year terms were P. H. Birckhead, vice president, Bucyrus-Erie Co., South Milwaukee, Wis., and C. B. Smythe, president-treasurer, Thew Shovel Co., Lorain.

D. H. Ross, Clark Equipment Co., Fred Salditt, Harnischfeger Corp., F. W. Zimmer, Manitowoc Engineering Corp., and J. P. Courtwright, Marion Power Shovel Co., remain as directors of the association.

Low-cost Moto-Bug puts fork lift service within economical reach of small foundries — and has unlimited usefulness as an auxiliary lifting tool in large shops. It handles a lot of light-load work where the cost of operating big, expensive lift trucks is prohibitive. Kwik-Mix S-10 Moto-Bug lifts 1000 pounds to 6-foot height. Forks are 20 or 30 inches long, adjustable 6 to 32 inches wide. There's full power forward and reverse — safe, automatic "deadman" brakes. Turning radius is only 61 inches — overall width 39 inches. *It's yours for only $1490 f.o.b. factory.* But that's not all —

For less than $90 you can add an interchangeable hopper body, or flat-bed platform for hauling loads up to 1500 pounds. This gives extra earnings on your original investment — provides 3-tool usefulness for all kinds of material-handling. Larger-capacity R-15 Moto-Bug with multiple attachments is also available at low cost. See your Kwik-Mix distributor today, or send for Moto-Bug® catalog.



mail to:

KWIK-MIX Company, Port Washington, Wis. (Koehring Subsidiary)

Send literature on S-10 Moto-Bug with: ☐ *fork lift* ☐ *hopper* ☐ *platform*

NAME ..... TITLE .....

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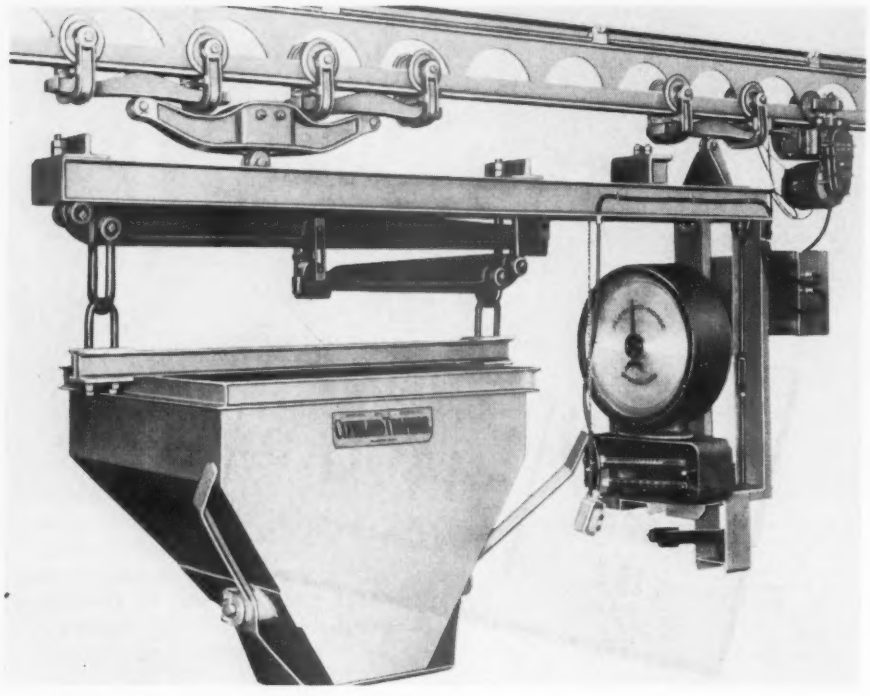
STREET .....

CITY ..... STATE .....

KM651 FO

New Equipment and Supplies



Traveling Hopper

with 1 cu yd capacity is automatic accelerating type

Cleveland Tramrail Division, Cleveland Crane & Engineering Co., Wickliffe, O.—Tractor-driven traveling hopper of 1 cu yd capacity is engineered for handling bulk materials. Hopper is so located in relation to its track that a large opening is provided at top for filling. Hopper is emptied by a bottom gate which can be manipulated from both sides of the bucket. A 5000-lb dial scale with tare beam enables weighing of ingredients. Spring clip markers facilitate quick weighing for repeat batches. Unit is propelled by a tractor drive at 150 fpm. Control is of pushbutton automatic accelerating type.

For More Details Circle No. 1—Page 201

Cleaning Abrasive

is heat treated high-carbon electric arc furnace steel

Wheelabrator Corp., 1102 South Byrkit St., Mishawaka, Ind.—Steel grit blast cleaning abrasive is of high-carbon electric arc furnace steel heat treated to provide toughness. It is in the same hardness range as chilled iron abrasives. Grits reportedly are free from brittle carbides which cause breakdown of chilled iron. Particles are said not to chip away upon impact. Seven sizes ranging from G-16 down to G-120 are available. All are screened to SAE size specifications. Abrasive is packaged in 50-lb lots in fiberboard cartons. Shipments of 1 ton or more are made on disposable pallets.

For More Details Circle No. 2—Page 201

Convection Ovens

give constant air weight circulation at all temperatures

Blue M Electric Co., 138th & Chatham St., Blue Island, Ill.—Horizontal airflow mechanical convection ovens with temperature range to 1200° F have application in research, pilot plant, production, chemical and metallurgical fields. Ovens feature an automatic control damper which progressively and automatically permits increased volume of air into the working chamber as temperature rises. Oven interior is 18-8 stainless steel. Exterior is heavy gage steel with front designed to prevent warpage at elevated temperatures. Three standard sizes can be supplied with voltages of 220 or 440, 3-phase, 60 cycle ac.

For More Details Circle No. 3—Page 201

Brinell Tester

features a ¾-in. penetrator stroke to speed testing cycle

Steel City Testing Machines Inc., 8817 Lyndon Ave., Detroit 38, Mich.—Motorized, bench type Brinell hardness tester features a ¾-in. stroke of penetrator so that operator need not readjust anvil height for each test when testing a series of pieces of about the same thickness. Vertical opening is adjustable by turning a three-spoked elevating nut. Throat depth is 6 in. Unit is compact, occupying an area of 9 x 25 in.

For More Details Circle No. 4—Page 201

Mold Conveyor

runs on recessed rails that are embedded in concrete

Nomad Foundry Equipment, Division of Westover Engineers, 3110 West Fond Du Lac Ave., Milwaukee 40, Wis.—Recessed mold conveyor rails are embedded in concrete. Molds are placed on pallets riding on the rails and are sent down the conveyor line for pouring. Manufacturer claims use of the recessed rail is an im-

For More Details on These Items
Use Reply Card—Page 201

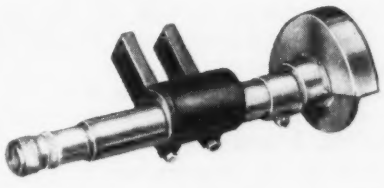
provement between the old "running out" and the new "rolling away" of molds. Work area is kept clear. Time saved can be used for additional production.

For More Details Circle No. 5—Page 201

Grinding Spindle

accommodates grinding wheels up to 5 in. in diameter

Wyzenbeek & Staff Inc., 223 North California Ave., Chicago 12, Ill.—Grinding spindle that fits all the company's flexible shafts facilitates



setup since the flexible shaft motor power is not coupled to the spindle until ready to grind. Spindle is available in three sizes to accommodate grinding wheels up to 5 in. in diameter. Each size is equipped with a quick-change attachment for snapping on and off the shaft of a flexible shaft grinder.

For More Details Circle No. 6—Page 201

Lifting Magnet

is battery-operated and designed for in-plant use

Ohio Electric Mfg. Co., 5400 Dunham Rd., Maple Heights, Cleveland, O.—Battery-operated lifting magnet of 2000 lb capacity is designed for in-plant use. Powered by self-contained, 12-v automotive batteries, the unit has a 7 3/16 x 20 in. magnetizing surface to provide penetration for odd-shaped parts which might be difficult to lift with sling, hook or grapple. Batteries need recharging every 5 to 12 average workshifts, or as shown by the charge indicator on the control panel.

For More Details Circle No. 7—Page 201

Cutoff Saw

cuts wet or dry with minimum burr left for remachining

Victor Engineering Corp., 15 Maple Ave., Paoli, Pa.—Cutoff saw features large bed, 16 in. blade capacity and 5-hp motor with multibelt drive. Saw is for cutting ferrous and nonferrous metals. Standard equipment is for wet cutting but machine can be used dry when necessary. A swivel cutting head and material clamp allows cutting up to 45 degrees with material remaining in same position as for a straight cut. For cutting gates and risers from large castings, an adapter will set the cutting head to one side. Various blades are available.

For More Details Circle No. 8—Page 201

Conveyor Belt

remains pliable when exposed to hot materials up to 350° F

B. F. Goodrich Co., Industrial Products Division, Akron, O.—Rubber conveyor belt reportedly remains pliable and elastic when exposed for long periods to the baking action of hot materials at temperatures up to 350° F. Construction is said to permit efficient service from mechanical splices. Belt is supplied in a choice of fabric reinforcement which includes glass fabric, rayon-nylon, rayon, cotton-nylon and cotton.

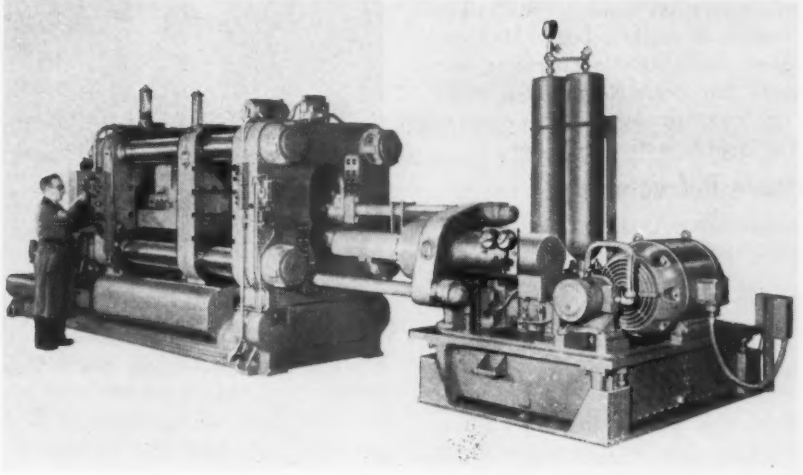
For More Details Circle No. 9—Page 201

Work Positioner

has holding power to solve many positioning problems

Wilton Tool Mfg. Co., 9525 Irving Park Rd., Schiller Park, Ill.—Work positioners with rated holding power from 5 to 1000 lb are available for manufacturers with assembly, welding or other bench positioning prob-

Machine Can Cast Large Aluminum Alloy Parts



ALUMINUM ALLOY parts weighing up to 35 lb reportedly can be cast on an 800-ton die casting machine. Automotive grills, transmission housings, motor blocks, outboard motor castings and other large components can be made on the machine. Die platens are 55 x 59 in. and variable die height from 16 to 34 in.

Of cold chamber design, the machine is said to offer a new approach to die casting. A positive, self-compensating mechanical link-wedge locks the clamp to the rated tonnage. No tie rod nut adjustment is required. Pushbutton control provides central screw and tonnage adjustment. Machine is equipped with electric-hydraulic safety interlock. Operational flexibility is realized by control of strokes, slowdowns and automatic cycling, including three core pull and ejector sequences.

Injection end is independent to provide open floor area for automatic ladling furnaces or other devices. Positive pressure follow-through with no delay and control through valves for distance-speed curve with the injection plunger are other features. All hydraulic elements are manifolded.

Central hydraulic and bumper bar ejection add to flexibility of the machine. Power input is 80 hp. Tie rods are 9 in. in diam and weight of machine is about 81,000 lb. Unit is made by Hydraulic Press Mfg. Co., Mt. Gilead, O.

For More Details Circle No. 10—Page 201

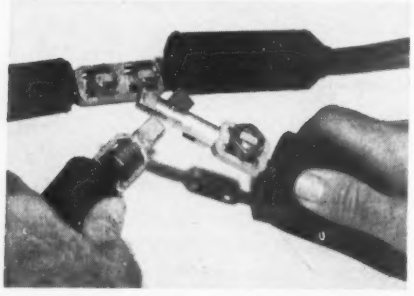
lems. Steel parts are cadmium plated to eliminate rust and corrosion. All models operate on the ball joint principle and lock firmly in any position.

For More Details Circle No. 11—Page 201

Magnet Connectors

are solderless to allow quick hook-up of lifting magnets

Electric Controller & Mfg. Co., 4500 Lee Rd., Cleveland 28, O.—Solderless electrical connectors and couplers



have been made standard equipment on company's circular all-welded lifting magnets. Rated at 100 amps continuous and accommodating Nos. 4, 6 or 8 flexible cable, the couplers and connectors permit rapid connecting and disconnecting of power leads. Magnet's original factory water-tight seal remains undisturbed. Magnets equipped with the connectors and couplers are available in sizes ranging up to 80 in.

For More Details Circle No. 12—Page 201

Castable Refractories

do not expand, shrink or crack with drying or burning

Robinson Clay Product Co., Refractories Division, 65 West State St., Akron 9, O.—Two super-duty hydraulic setting castable refractories have service limits of 2900 and 3000° F. Both are available with heat stabilizers that eliminate strength losses in the 1300 to 2000° F range. The 2900° refractory is intended for forming hearths, doors and supported roofs and is a high-strength castable. The 3000° refractory is a medium strength castable intended for use at very high temperatures. Both are shipped dry in 100-lb moisture-proof sacks ready for mixing.

For More Details Circle No. 13—Page 201

Grinding Aid

prolongs life of abrasive belts and improves finishes

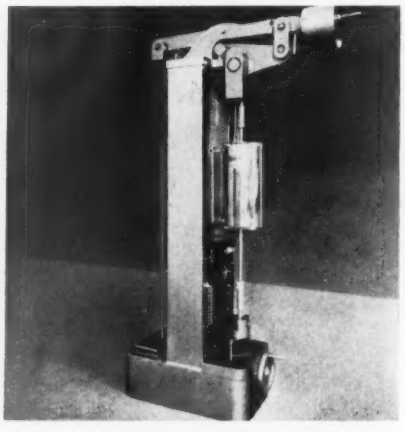
Coated Abrasives Division, Armour & Co., Alliance, O.—Liquid chemical metal grinding aid having the consistency of honey is said to prolong cutting life of abrasive belts and provide an improved surface finish. Material is an oil-like substance, not a water solution, and is used at temperatures around 120° F. This temperature is achieved by an immersion heater in the oil reservoirs of conventional grinding machines. Best results are obtained by introducing material as a stream onto the belt surface just prior to contact with the work.

For More Details Circle No. 14—Page 201

Creep Testing Machine

is versatile and can perform several types of metal tests

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.—Creep testing machine of 20,000 lb capacity can perform long-time creep tests, creep-rupture tests, relaxation tests and constant strain rate tests. Basic machine has this versatility through use of different subassemblies and components. Unit has an attached furnace for tests up to 1800° F. Furnace is 16 in. long and has thermocouple for control and heat measurement. Creep measurements can be



made inside the furnace by an optical extensometer attached to the specimen over a 3½-in. gage length. Accuracy of the load systems is within 1 per cent of applied load or 0.2 per cent of capacity, whichever is greater.

For More Details Circle No. 15—Page 201

Air Volume Boosters

are designed to provide fast valve, air cylinder response

Governaire Division, Belloframe Corp., Burlington, Mass.—Air volume boosters are for speeding responses of air cylinders or diaphragm valves. Boosters have ⅝-in.-diam supply and exhaust seats with a flow capacity of 115 cfm when signal pressure is 10 psi and supply pressure is 50 psi. With 150 psi supply pressure, capacity is 170 cfm. Maximum signal pressure change needed to initiate output change is less than 1 in. of water. Boosters can be supplied in ⅜, ½ and ¾-in. pipe sizes in ratios of 1:1, 1:2, 1:3, 2:1 and 3:1.

For More Details Circle No. 16—Page 201

Hacksaw Blades

are color-identified to ease selection of correct blade

L. S. Starrett Co., Athol, Mass.—Power and hand hacksaw blades with special characteristics for cutting wide range of materials are distinctively color-identified to make it easy to select and use the right blade for any job. Blades are of high-speed steel specially tempered for toughness and designed for specific cutting applications.

For More Details Circle No. 17—Page 201

Toggle Clamps

provide maximum bar travel with minimum handle movement

Erico Products Inc., 2070 East 61st Pl., Cleveland 3, O.—Company has added two toggle clamps to its line. One is rated at 1000 lb vertical clamping pressure, the other at 2000 lb. Linkage design is said to provide maximum bar travel with minimum handle movement.

For More Details Circle No. 18—Page 201

Mobile Crane

with 15-ton capacity has a 27½ ft turning radius

Koehring Co., 3026 West Concordia Ave., Milwaukee 16, Wis.—Mobile crane has a 15-ton lift capacity, top speed of 21 mph and is controlled by one man from same control position for both travel and work. One engine supplies all power. Unit has a turning radius of 27½ ft. Crane is equipped with outriggers front and back for support during stationary

operations. For special high lifts, the standard 25-ft boom can be lengthened to a maximum of 55 ft.

For More Details Circle No. 19—Page 201

Fire Monitor

may be mounted on any type of fire fighting vehicle

Chicksan Co., Brea, Calif.—Fire monitor discharges water through a 2½-in. tip at a rate of 2000 gpm with an effective striking range of 300 ft.

HELPFUL
Foundry Literature

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Handy Reader Service cards bring you more information on products or services described or advertised in this issue.

50. pH Meter

Burrell Corp., 2223 Fifth Ave., Pittsburgh 19, Pa.—Form 118 illustrates and details features of self-contained, compact pH meter that is suited for laboratory as well as plant and field use. Frame carries the instrument together with beakers, wash bottle and bottle for buffer. Unit contains its own batteries and requires no connection to a power outlet.

51. Traveling Cranes

Whiting Corp., Harvey, Ill.—Handbook on electric traveling cranes is available to qualified engineers and others directly interested in crane specification. Book contains 17 sections of data for engineers and architects for the preparation and checking of specifications for new projects as well as application of new cranes to existing structures.

52. Casting Cleaning

Kolene Corp., 12890 Westwood Ave., Detroit 23, Mich.—Chemical cleaning method for descaling iron, steel and alloys, removing sand from castings or preparing cast iron for bonding is described in bulletin, "The Solution to Your Problems in Metal Surface Preparation."

53. Fire Protection

"Automatic" Sprinkler Corp. of America, 1107 Wick Ave., Youngstown 1, O.—Illustrated catalog covers the generally accepted methods of fire detection, fire prevention, fire control and fire extinguishment associated with the field of special hazard fire protection.

54. Casting Impregnation

Tincher Products Co., Sycamore, Ill.—Folder illustrates step-by-step procedures and equipment required in impregnation sealing of pressure castings. Either plastic or metallic sealants can be used.

55. Swarf Collection

Norton Co., Worcester 6, Mass.—Booklet describes benefits of collecting swarf from diamond grinding wheel operations and salvaging worn out diamond wheel stubs. Booklet includes information about where swarf can be sent for reclamation, value of diamond salvaged and types of swarf accepted for salvage.

56. Bottom Boards

R & J Foundry Co., 610 South 94th St., Milwaukee 14, Wis.—Leaflet provides information and in-use photographs of wood and aluminum cleat aluminum bottom boards made in wide range of standard sizes as well as to order for special requirements.

57. Ovens and Furnaces

Blue M Electric Co., 138th & Chatham St., Blue Island, Ill.—Electric ovens, furnaces, water and oil baths, humidity cabinets and incubators for analytical and general research laboratories, pilot plant and production are illustrated and described in catalog.

58. Shell Molding

Durez Plastics Division, Hooker Electrochemical Co., 1008 Walck Rd., North Tonawanda, N. Y.—No. 10 in

EQUIPMENT and SUPPLIES—HELPFUL LITERATURE **March 1956**

Circle identifying numbers of items which interest you:

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6-7	28	52	73	95	168	196	224	247	262	276T	281R1
8	29	53	74	96	169	197	225	248	263	276BL	281B
9	30-31	54	75	97	170	206	226-7	249L	265	276BR1	282T
10	32	55	76-77	98	171	207	229	249R	266T	276BR2	282BL
11	35	56	78	99	172	208	230	250	266B	276BR3	282BR1
12	36	57	79	100	173	209	231	251L	267L	277TL	282BR2
13	37	58	80	101	175	210	232	251R	267R	277BL	283TL
14	38-39	59	81	102	177	211	233	252	268T	277R	283R
15	40	60	82-83	145	178	212	234	253BL	268B	278T	296T
16-17	41	61	84	147	179	213	237	253R	269	278BL	296BL
18	42	62	85	148	180	214	238-9	254	270	278BR1	296BR
19	43	63	86	150-1	182-3	215	240	255	271T	278BR2	299R
20-21	44	64	87	153	185	216	241BL	257	271B	279TL	300
22	45	65	88	155	186	217	241R	258	272T	279BL	IBC
23	46-47	66	89	157	189	218	242	259L	272B	279R	OBC
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company's series of bulletins *Shell Molding News*, presents two case histories of successful shell molding applications.

59. Aluminum Alloys

Kaiser Aluminum & Chemical Sales Inc., Industrial Service Division-PR 256, 1924 Broadway, Oakland 12, Calif.—Information on company's aluminum mill products and services, including application and selection data for sand, permanent mold and die casting alloys, are found in booklet.

60. Handling Castings

Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 3, O.—Case history No. 31 details handling of malleable iron castings by a leading New England foundry using a battery-powered 6000 lb capacity mobile crane equipped with an electromagnet to handle 200,000 lb of scrap daily.

61. Industrial Fans

American Blower Corp., Detroit 32, Mich.—Bulletin 5306 describes features of industrial fans said to provide full-range coverage of industrial air and material handling requirements. Construction details, specifications, rating table terminology, ordering data and operating limits are discussed.

62. Lift Trucks

Yale & Towne Mfg. Co., 11000 Roosevelt Blvd., Philadelphia 15, Pa.—Folder uses a "phantom view" presentation to portray in detail all internal features of engine and transmission of lift trucks with capacities from 3000 to 8000 lb that can be powered with gasoline, diesel or liquefied petroleum gas engines.

63. Crane Electrification

Cleveland Crane & Engineering Co., Wickliffe, O.—Catalog 2021-A offers drawings and information necessary for ordering aluminum conductors, supports and collectors for the electrification of all makes of cranes and runways requiring current in amounts of 300 to 1000 amps.

64. Instrumentation

Illinois Testing Laboratories Inc., 420 North La Salle St., Chicago 10, Ill.—Bulletin highlights features of about 20 pyrometers, thermometers, thermocouples, thermobulbs, extension arms, air velocity meters and dewpoint indicators. Number of the bulletin providing complete engineering data on the instrument also is included.

65. Steel Grit

Wheelabrator Corp., 1102 South Byrkit St., Mishawaka, Ind.—Bulletin 901-D describes features of a heat treated high carbon steel grit for blast cleaning operations. Seven sizes, screened to SAE specifications, can be supplied.

66. Ultrasonic Inspection

Sperry Products Inc., Danbury, Conn.—Bulletin 50-105 illustrates uses of the ultrasonic reflectoscope as an instrument for nondestructive testing of products and equipment. Principles of ultrasonic testing are explained in simplified terms.

67. Kiln Type Ovens

Michigan Oven Co., 415 Brainard, Detroit 1, Mich.—Bulletin 554 covers kiln type ovens available in six sizes for baking, curing, drying and heating using gas fuels or electricity.

68. Electrical Fittings

Buchanan Electrical Products Corp., Hillside, N. J.—Specifications, dimensional data, application instructions

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INDEX to NEW EQUIPMENT AND SUPPLIES

Descriptions start on page 198. For more data circle item numbers on Reader Service cards.

ITEM

1. Traveling Hopper
2. Cleaning Abrasive
3. Convection Ovens
4. Brinell Tester
5. Mold Conveyor
6. Grinding Spindle
7. Lifting Magnet
8. Cutoff Saw
9. Work Positioner
10. Die Casting Machine
11. Conveyor Belt
12. Magnet Connectors
13. Castable Refractories
14. Grinding Aid
15. Creep Testing Machine
16. Air Volume Boosters
17. Hacksaw Blades
18. Toggle Clamps
19. Mobile Crane
20. Fire Monitor
21. Space Heater
22. Plastic Laminate
23. Cutting Torch
24. Brake Motor
25. Fork Truck
26. Gear Drives
27. Paging Receiver
28. High Heat Paint
29. Hardness Tester
30. Vacuum Cleaner
31. Crane Controls
32. Dust-Fume Collectors
33. Tractor Shovel
34. Pallet Truck
35. Eyewear Frame
36. Air Cylinders
37. Paper Wipers
38. Jig Saw
39. Roof Repair Kit
40. Hand Type Holders
41. Light Weight Wheels
42. Platform Truck
43. Strain Gages

and ordering information for solderless fittings and electrical hardware products are offered in bulletin 561.

69. Nonferrous Alloys

R. Lavin & Sons Inc., 3426 South Kedzie Ave., Chicago 23, Ill.—December issue of *The Lavingot News and Views* covers nomenclature, specifications, chemical composition and physical properties of copper-nickel ingot and casting alloys. General information on melting procedures and gating to aid directional solidification also is included.

70. Ceramic Coatings

Montaine Corp., 7127 South Chicago Ave., Chicago 19, Ill.—Folder contains engineering data on superrefractory coating applied by flame-spraying process. Material is virtually pure aluminum oxide, melts over 3600° F, resists almost all corrosive media, is thermally insulative and electrically nonconductive.

71. Power Tools

Boice-Crane Co., 907 Central Ave., Toledo 6, O.—Catalog 55 describes and illustrates power tools for cutting, shaping, drilling and finishing wood, metal, fibre and plastic. Jointers, planers, band saws, drill presses, filers and grinders, lathes, sanders and shapers are covered.

72. Burn Treatment

E. D. Bullard Co., 275 Eighth St., San Francisco 3, Calif.—Laboratory reports on the effects of nontoxic, nonirritating relief agent for use on first, second or third degree burns are available. Treatment is sprayed on from an aerosol sprayer.

73. Engineering Service

Lester B. Knight & Associates Inc., 600 West Jackson Blvd., Chicago 6, Ill.—Booklet details engineering services available to foundry management to make an analysis of a problem out of which will come recommendations for improvement.

74. Gearmotors

Link-Belt Co., Dept. PR, 307 North Michigan Ave., Chicago 1, Ill.—Selection data, construction features, load classifications, dimension tables, overhung load ratings and mounting assemblies for line of gearmotors are described in book 2447.

75. Portable Analyzer

Davis Instruments, Division of Davis Emergency Equipment Co., 47 Halleck St., Newark 4, N. J.—Self-contained portable analyzer and alarm system for combustible gases is detailed in bulletin 11-35.

76. Fluids and Lubricants

Carbide & Carbon Chemicals Co., Division of Union Carbide & Carbon Corp., 30 East 42nd St., New York 17, N. Y.—Properties, applications and characteristics of polyalkylene-glycol derivatives are covered in Booklet 6500D. Fluids and lubricants have uses as mechanical lubricants, hydraulic fluids, heat transfer fluids, solvents and formulation compounds.

77. Radiant Heating Units

Fostoria Pressed Steel Corp., Fostoria, O.—Specifications, application data and general information on quartz lamp and radiant rod oven sections as sources of radiant energy suited to high temperature applications are found in bulletins 55-105 and 55-104, respectively.

78. Control Valves

Ross Operating Valve Co., 120 East Golden Gate Ave., Detroit 3, Mich.—Bulletin 101B highlights features, operating principles and advantages of pilot operated introld and retrold valves, direct operated valves and miscellaneous special valves.

79. Barrel Finishing

Casalbi Co., Jackson, Mich.—Catalog C-1 illustrates and describes motor and belt driven tumbling barrels with either wood or steel shells. A variety of sizes and capacities can be supplied.

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80. Roofing and Siding

Toledo Porcelain Enamel Products Co., 2275 Smead Ave., Toledo, O.—Properties of a corrugated porcelain enamel-on-steel roofing and siding are described in brochure. Engineering data, details of sheets and flashings and methods of installation also are included.

81. Hydraulic Fluid

E. F. Houghton & Co., 303 West Lehigh Ave., Philadelphia 33, Pa.—Bulletin describes fire resistant hy-

EQUIPMENT and SUPPLIES—HELPFUL LITERATURE **March 1956**

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draulic fluid and offers information on installation and maintenance of the fluid where potential fire hazards exist.

82. Blast Cleaning

Pangborn Corp., 1400 Pangborn Blvd., Hagerstown, Md.—Vol. XI, No. 2 of *Pangborn News* presents eight case histories of industrial blast cleaning and dust control installations that provide increased efficiency at reduced cost.

83. Protective Clothing

B. F. Goodrich Co., Industrial Products Division, Akron, O.—Line of protective clothing is featured in catalog. Gloves, raincoats, overalls, hats, aprons and industrial clothing made of Koroseal are covered.

84. Conveyor Belts

Main Belting Co., Dept. 435, Middletown, Conn.—Specifications, selection and engineering data on stitched canvas belts for all types of conveying are included in catalog.

85. Puller

Chisholm-Moore Hoist Division, Columbus McKinnon Chain Corp., Tonawanda, N. Y.—Several models of lightweight, portable puller operated by a ratchet handle with capacities from ¾ to 6 ton are illustrated in bulletin 146-G.

86. Magnifier

Earl Elwyn Smith Associates, Seven South Main St., West Hartford 7, Conn.—Leaflet illustrates and describes a pocket-size magnifier that increases size of defect or object four or seven times and throws a beam of light on same.

87. Band Saws

Johnson Mfg. Corp., Albion, Mich.—Brochure illustrates and highlights features of six metal-cutting band saws with capacities up to 10 in. with round material and 18 in. with wide, flat material.

88. Insulating Castables

J. H. France Refractories Co., 1944 France Rd., Snow Shoe, Pa.—Service bulletin contains in-use photographs and recommendations on use of insulating castables.

89. Steel Flooring

Irving Subway Grating Co., Long Island City 1, N. Y.—Catalog describes uses, advantages and installation procedures for industrial floor covering made of steel bars on edge, bent and joined together in a continuous hexagonal mesh pattern.

90. Solenoid Valve

Automatic Switch Co., 391 Lakeside Ave., Orange, N. J.—Brochure describes a ¾-in. general purpose 2-way solenoid valve with full area port available with either pressed steel, watertight or explosion-proof solenoid enclosure.

91. Furnaces

Reda Pump Co., Furnace Division, Bartlesville, Okla.—Performance data, dimensions and general information on reflecting type furnaces for ferrous and nonferrous melting are found in bulletin.

92. Air Motor

Gast Mfg. Corp., Box 117N, Benton Harbor, Mich.— Performance curves, advantages and general information on 2-hp rotary air motor are covered in bulletin 855-22.

93. Products List

Acheson Colloids Co., Division of Acheson Industries Inc., Port Huron, Mich.—Booklet lists 42 colloidal and semi-colloidal dispersions for foundry, metalworking and related industries.

94. Self-Propelled Crane

Schield Bantam Co., Waverly, Iowa—Bulletin A-232 provides specifications and capacities for self-propelled crane of 6 ton capacity.

IMPORTANT READING FOR FOUNDRYMEN

We have a limited quantity of the following reprints which we can furnish while they last.

95. Plaster Mold Castings

"The Antioch Process for Making Intricate Plaster Mold Castings" by Kenneth L. Mountain details the operations of Morris Bean & Co., Yellow Springs, O., which after years of research and experimentation, has refined a casting process to produce accurate, intricate, pressure-tight, high-strength, surface smooth castings that do not require machining.

96. Closed-Top Cupolas

"Closed-Top Cupolas End Air Contamination" by Robert H. Herrmann describes an installation of four hot-blast, sealed cupolas with wet impingement-type collectors at Ford Motor Co., Dearborn Iron Foundry, Dearborn, Mich. System almost completely eliminates atmospheric contamination due to stack discharge.

97. Small Steel Foundry

"Small Steel Foundry Produces Specialty Castings" by Edwin Bremer highlights the operating techniques of Waunakee Alloy Casting Corp., Waunakee, Wis., a producer of proprietary high-alloy wear and heat resisting steel castings for hot working applications in steel mills.

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unit is operated by hydraulic pistons with power from diverted water pressure. Pressure range is 30 to 300 lb. Hydraulic valves and levers move the monitor through a horizontal travel pattern of 270 degrees and vertical motion of 120 degrees. Device may be mounted on any fire fighting vehicle or can be stationed for general coverage of a given area. Weight complete is 650 lb.

For More Details Circle No. 20—Page 201

Space Heater

features automatic electronic combustion control system

Airtherm Mfg. Co., 700 South Spring St., St. Louis 10, Mo.—Direct-fired space heater has a fully automatic electronic combustion control system and is made in eight sizes from 400,000 to 2,000,000 Btu per hr output. Unit is equipped with single switch changeover from oil to gas. Combustion chamber is rolled stainless steel for long life and silent operation. Heater provides heat in the winter and ventilation in the summer.

For More Details Circle No. 21—Page 201

Plastic Laminate

can be adhesive bonded to almost any contoured surface

M. W. Kellogg Co., 4 Barclay St., New York, N. Y.—Fluorocarbon plastic laminate consisting of thin—10 to 12 mil—continuous plastic on glass cloth assertedly can be adhesive bonded to almost any contoured surface. According to the supplier, the material can be used for lining hoppers, ducts, fume hoods, pipes, chutes, tanks, drums and pails. Other applications envisioned include surfacing for foundry parting boards, conveyor belting, resin casting forms and foam rubber molds. Laminate is available in sheets 36 x 46 in. Longer sheets, 36 in. wide, can be made on special order. Laminates are made by Garlock Packing Co., Palmyra, N. Y. and U. S. Gasket Co., Camden, N. J.

For More Details Circle No. 22—Page 201

Cutting Torch

runs from dc welding machine and compressed air line

Arcair Co., 423 South Mt. Pleasant St., Lancaster, O.—Cutting and gouging torch is designed for removing defects in castings, cleaning roots of welds and removing welds. Also for grooving, beveling, gouging or cutting mild steel, stainless steel, hard alloys, brass, bronze, monel and cast iron. Torch operates from an ordinary direct current welding machine and a compressed air line and fea-

Brake Motor Makes Metal Handling Easier

A NEW TYPE of brake motor helps to transport crucibles of molten metal and pour molds faster and easier at the Bearing Bronze Casting Co., Cleveland. This motor serves as a bridge drive on the crane transporting metal from the furnaces.

When a crucible arrives at the molds, which are set out on the floor, the braking feature of the motor prevents the crane from drifting and assists in its being spotted quickly. Once the crane is positioned, it is held in place by the brake as the hoist and crucible are moved over the molds. This is said to have speeded up pouring and to have eliminated spillage and trouble from interrupted pouring caused by crane drift.

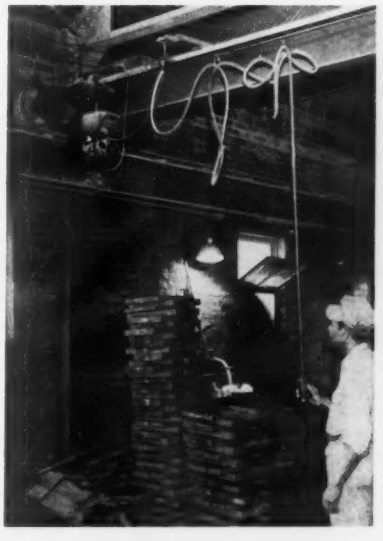
The brake motor, a compact unit developed by the Cleveland Electric Motor Co., Cleveland 3, has completely mechanical and automatic braking action. The braking action is controlled by tension of four springs which press a brake disk against a stationary friction disk. When the motor starts, revolving flyweights release this pressure at a rate dependent on the tension of the springs. Braking action can be varied by adjustment of the spring tension which is easily done from outside the motor. Components of the brake are shown in the accompanying exploded view.

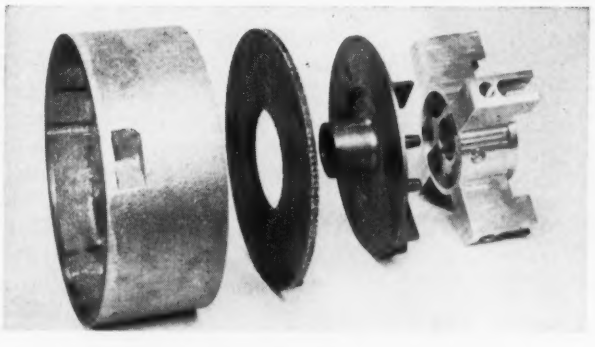
For the type of service encountered on cranes the brake motor is designed for smooth acceleration as well as gradual braking, to prevent the "load sway" hazard to personnel.

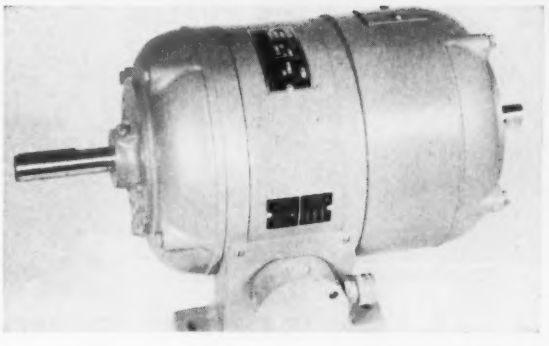
Minimal maintenance is a feature of these brake motors, due to elimination of solenoid coils and the excellent life of the friction disk material. Adjustment of the unit for faster or slower braking action can be done in five to ten minutes.

Units are now available in ratings from 1/6 to 5 hp at 1800 rpm. Larger ratings are available on demand.

For More Details Circle No. 23—Page 201







tures a rotating nozzle that permits changing electrode angle while maintaining air jet in alignment. It will take up to 5/8-in.-diam electrodes.

For More Details Circle No. 24—Page 201

Fork Truck

features compact design for turning in cramped quarters

Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 3, O.—Fork truck with 3000 lb capacity has short wheelbase and 360-degree steering to permit maneuvering in narrow aisles and inside box cars and truck trailers. A steering mechanism prevents steering wheel kick-back. Stand-up end control is provided for convenience on jobs where operator must get on and off the truck frequently.

For More Details Circle No. 25—Page 201

Gear Drives

are designed for industrial speed reduction problems

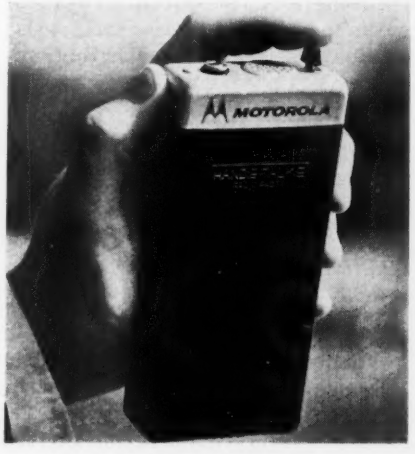
Link-Belt Co., Dept. P.R., 307 North Michigan Ave., Chicago 1, Ill.—Helical gear drives are designed to meet many industrial speed reduction problems while combining a high degree of standardization with ability to stand up in heavy-duty service. Double reduction drives are available in ratios from 6.2 to 1 through 38.4 to 1 with capacities up to 118 hp. Triple reduction drives are available in ratios from 47.1 through 292 to 1 with capacities up to 20 hp.

For More Details Circle No. 26—Page 201

Paging Receiver

permits private, individual paging of key personnel

Motorola Communications & Electronics Inc., 4501 Augusta Blvd., Chicago 51, Ill.—Pocket radio paging receiver permits selective calling of key personnel in a building or plant area. System consists of a selector console, an FM transmitter that radiates alerting tones and voice messages



within a confined induction area and the individual transistorized radio receivers that fit into the pocket. Operator or receptionist presses selector button on a pagee's receiver alerting mechanism, then speaks into a desk microphone. No other receiver in the system hears the alerting tone or the message. Receiver weighs 10 oz and is slightly larger than a package of king-size cigarettes. Battery life is said to approximate four 40-hr weeks. Reception reportedly is immune to common types of interference generated by X-ray, diathermy or other static-generating equipment.

For More Details Circle No. 27—Page 201

High Heat Paint

will protect surfaces up to temperatures of 750° F

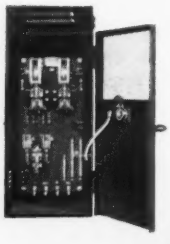
Speco Inc., 7308 Associate Ave., Cleveland 9, O.—Black high heat paint is said to offer protection to surfaces subjected to temperatures up to 750° F. Paint consists of a black pitch base bolstered with a silicone additive. Combination reputedly does not blister or become brittle when subjected to varied temperatures, smoke, fumes, mild industrial acids, alkalis and moisture. It air dries in 8 to 10 hr and does not

For faster load discharge... low cost operation... longer life...

EC&M Magnet Controllers have earned a reputation for improved magnet operation. Loads are discharged quickly . . . cleanly . . . without "dribble". Magnets "work more" because faster drops eliminate "positioning" the magnet at point of discharge.

A simple two-position (lift-drop) Master Switch makes operation easy . . . power is off when the master switch is in the drop position. This prevents overheating, keeps lifting capacity high, and substantially adds to magnet life.

EC&M Controller has exclusive adjustable discharge feature for different type loads. (Dial on door).



EC & M MAGNET CONTROLLERS

THE ELECTRIC CONTROLLER & MFG. CO.
4520 Lee Road • Cleveland 28, Ohio

ACME RESIN

PlastiSand PROCESS

Resin formulation and the coating process covered by Patents Pending

Shell molding foundries are discovering the fact that when the PLASTISAND Process, using liquid-resin coated sand, is employed—DUST IS ELIMINATED. This feature alone makes the process invaluable because of the safety and health factor. The absence of dust means healthier working conditions, safer, cleaner factories. No irritating resin dust fumes, danger of dust explosion is eliminated—plant efficiency is increased.

In the PLASTISAND Process—each grain of sand is uniformly coated with partially polymerized thermosetting resin. Permanent, even distribution of the liquid resin throughout the sand results in smoother finishes and higher strengths.

PROVED SAVINGS, Too!

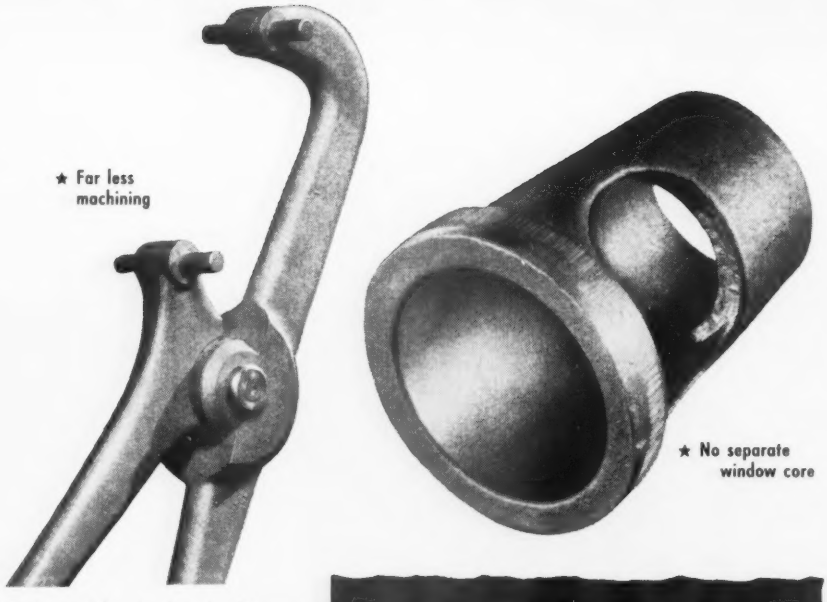
1. The PLASTISAND Process, a totally new development by Acme Resin Corporation in the relatively new field of foundry shell molding, assures savings—because of a shorter dwell, and a faster cure—shorter time on the pattern and a faster baking cycle.
2. You can be certain of superior molds with as little as one-*half* the resin content formerly necessary with dry resin.
3. Hot or cold mulling—adaptable to dump-box, roll-over and blowing of either shells or cores.
4. **SUPERIOR TENSILE STRENGTH**—PLASTISAND molds have greater cold strength, a factor gaining importance as new stack pouring techniques are developed.
5. **NON-SEGREGATING**—Each grain of sand is completely, uniformly coated with liquid phenolic resin in the PLASTISAND Process—segregation cannot occur.
6. **EXCELLENT HOT STRENGTH**—The hot strength of PLASTISAND molds is equal or superior to that obtained by the use of dry-resin sand mixes.
7. **GREATER PRODUCT UNIFORMITY**—Because it is non-segregating, resin-coated sand prepared by the PLASTISAND Process yields almost identical molds, batch after batch.

An informative booklet has been prepared to better acquaint the foundry industry with the new PLASTISAND Process. It may be obtained by writing to the ACME RESIN CORPORATION at the address listed below right.

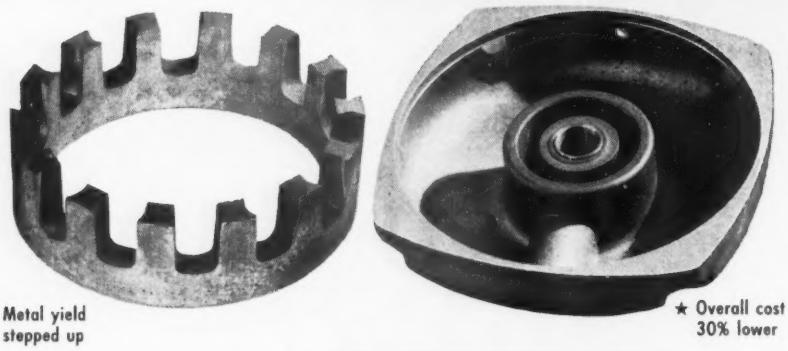
20-POWER MAGNIFICATION OF RESIN-COATED GRAINS OF SAND.

ACME RESIN CORPORATION

1401 CIRCLE AVENUE • FOREST PARK, ILLINOIS



Shell Molding **ECONOMY**



at its best...with **DUREZ** *resins*

These are not isolated examples of operating and dollar savings that result from casting in Durez resin-bonded shell molds.

Just the opposite is true. There are literally hundreds of jobs where Durez thermosetting resins consistently help to produce uniformly improved casting surfaces, within closer finish tolerances, on simple or complicated contours, with substantial savings in shipping cost and metal removal.

This is so because foundries can rely on getting uniformly hard, strong shells when they standardize on Durez. The resin itself is uniform. It cures fast, takes a rigid set with a surface almost pattern-smooth.

In using Durez foundry resin you can profit from experience acquired in pioneering the development of these materials. Whether or not you are now using them, the experience of the Hooker organization—50 years in chemicals and 35 in resins—is at your service.

Tell us what you'd like to know—and let us send you our bi-monthly "Shell Molding News."

DUREZ® *Phenolic Resins for Shell Molding*

DUREZ PLASTICS DIVISION
HOOKER ELECTROCHEMICAL COMPANY
1003 Walck Road, North Tonawanda, N. Y.

HOOKER® CHEMICALS & PLASTICS

require special baking to be effective. Recommended uses include compressors, turbines, boilers, stacks, tanks, ovens, furnaces, steam lines and heat lines.

For More Details Circle No. 28—Page 201

Hardness Tester

utilizes photo resistors and intricate timing mechanisms

Wilson Mechanical Instrument Division, American Chain & Cable Co., 929 Connecticut Ave., Bridgeport 2, Conn.—Automatic Rockwell hardness tester uses photo resistors and intricate timing mechanisms to test ferrous and nonferrous metals in hard or soft condition at a rate up to 1000 pieces an hour. Parts to be tested are power fed into machine through a hopper arrangement to a position beneath a diamond penetrator. Testing loads force the diamond into part to determine hardness of material. Parts are routed into bins labeled as hard, good and soft. Colored lights, mounted above the dial, show the classification of each part as it is tested.

For More Details Circle No. 29—Page 201

Vacuum Cleaner

uses compressed air only and has no moving parts

American Balmes Corp., 859 Summer Ave., Newark 4, N. J.—Industrial vacuum cleaner operates by use of compressed air only and has no electrical connections, no motor, no bearings or moving parts. Cleaner operates on normal plant compressed air system and uses 25 cfm. Capacity is 20 gal. Overall size is 33 in. high and 24 in. in diam.

For More Details Circle No. 30—Page 201

Crane Controls

can operate as many as eight cranes from one power circuit

Femco Inc., Irwin, Pa.—Electronic system provides remote control of traveling cranes from the plant floor. With the control, an operator

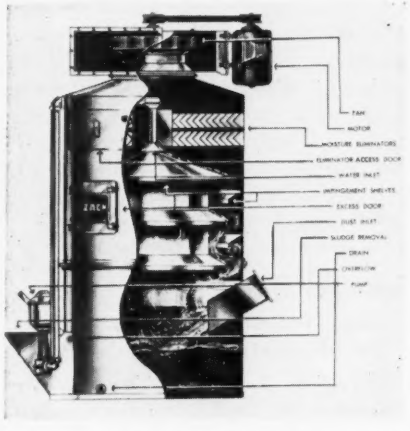
can raise or lower the hoist (5 positions), position the trolley forward or reverse (5 positions), travel forward or reverse (3 positions) and can energize or turn off a magnet, all from the floor. As many as eight cranes can be controlled on one power circuit by use of different carrier frequencies. One operator can operate more than one crane. Floor control panel may be in a permanent location or mounted on a cart for portability from one power receptacle to another.

For More Details Circle No. 31—Page 201

Dust-Fume Collectors

have internal design to set up a cyclonic washing action

Zack Co., 4600 West 12th Pl., Chicago 50, Ill.—Floor type and cone type dust-fume collectors consist of a cylindrical drum and internal cone and baffle design said to result in "cyclonic" washing action that creates a turbulence to separate wet dust and carry it to a sludge tank. Collectors have flat bottoms that serve as settling tanks from which the water is recirculated. A chute type cleanout is provided for hand cleaning of settling tank. Flight conveyors can be supplied for automatic ejection of sludge from tanks to containers. Sizes and capacities from 500 to 40,000 cfm are available.



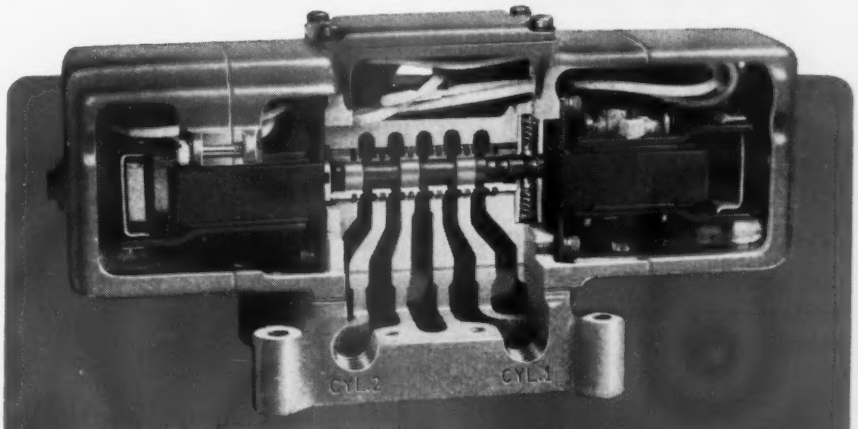
For More Details Circle No. 32—Page 201

Tractor-Shovel

has a torque converter drive and full-reversing transmission

Frank G. Hough Co., 703 Seventh St., Libertyville, Ill.—Two-wheel drive tractor-shovel has a struck capacity of ¾ cu yd and a heaped capacity of 1 cu yd. A bucket breakout action permits 40 degrees of tip-back at ground level. Model has a breakout force of 4500 lb, a lifting capacity of 4000 lb and a carrying capacity of 3000 lb at 4 mph. Torque converter drive and 4-speed full-reversing transmission powered by a gas engine develop 57 hp and travel

something NEW!



a BETTER air valve

. . . the SA series

NEW SIMPLICITY . . . a lapped spool sliding in a hardened sleeve provides the valving action—*One moving part.*

NEW RELIABILITY . . . the valve has no moving seals; eliminates wear, sticking, swelling of elastic seals. Gives positive, trouble-free performance.

NEW RUGGEDNESS . . . the SA Series sets new standards for long life. Outwears ordinary valves on every test.

NEW DESIGN . . . full sub-plate mounting, watertight solenoid enclosures, integral junction boxes on all double solenoid models, side ports, bottom ports, O-ring manifold mount . . . all are standard on the SA Series.

The SA Series offers a complete line of actions, single solenoid spring return, double solenoid momentary contact and double solenoid spring centered 4-way actions . . . single and dual pressure versions. 54 different models in sizes ¼" through ¾" pipe. The most complete family of 4-way air valves available.

Get complete information and specifications by mailing the coupon.

NUMATICS, Inc. MILFORD, MICHIGAN

NUMATICS Inc.
106 Main Street
Milford, Michigan

Send me your catalog No. 8000 on the new SA Series Valves.

NAME_____

COMPANY_____

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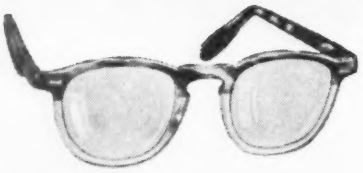
LOOK TO WILLSON

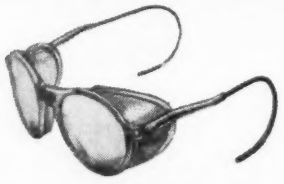
...FOR SAFETY SPECTACLES

that combine the protection your workers need with the style and comfort they want.



New Style WFH

Handsome safety spectacle with new lens shape in frames with demi-amber overlay on upper half of crystal butyrate.

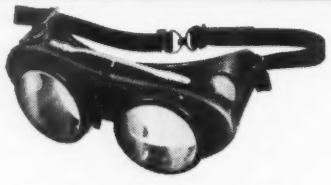


Exclusive Contour-Spec®

Patented hinged bridge makes this spectacle the most comfortable to wear. Provides full closure around eye cavity.

...FOR CUP GOGGLES

that provide the utmost in eye protection. The complete range of Willson goggle styles meets every eye protection need.



Convenient Kover-Mor®

This roomy style CC70 goggle is roomy enough to go over almost any style of personal glasses. Rigid top bar makes them easy to put on and take off with one hand.

...FOR RESPIRATORS AND GAS MASKS

for almost any respiratory hazard. The Willson line carries more Bureau of Mines approvals than any other.

Interchangeable Series 800

This is the first truly interchangeable respirator. It requires no additional parts or accessories to make use of 4 different cartridges and 4 different filters or combinations of both.

...FOR HARD HATS AND CAPS

In either lightweight Fiberglas, in 5 colors, or fabric reinforced Phenolic Resin, the strongest hat shell made. Choice of four suspensions to suit your individual requirements.

Super-Tough Phenolic

This toughest of all safety hats is reinforced with ten individual die-cut pieces of sturdy duck and molded under pressure to withstand repeated drop-ball tests *without fracture!*

WILLSON PRODUCTS, INC.

Over 300 Safety products carry this famous trademark

237 Washington Street • Reading, Pennsylvania

speeds range from 0 to 14 mph forward and from 0 to 23 mph in reverse.

For More Details Circle No. 33—Page 201

Pallet Truck

is all-hydraulic with two speeds forward and reverse

Hydreco, Division of New York Air Brake Co., 1100 East 222nd St., Cleveland, O.—Double, fixed displacement, gear type hydraulic pump and and a single, fixed displacement, gear

type fluid motor are used to provide two speeds forward and reverse for all-hydraulic pallet truck. Truck has a heavy, all-steel arc-welded frame with safety tread operator's platform. Steering mechanism is ball-bearing mounted. Top speed with a 2-ton load is 3 mph. Truck is made by Colson Corp., Elyria, O.

For More Details Circle No. 34—Page 201

Eyewear Frame

combines metal and plastic for added strength and safety

Bausch & Lomb Optical Co., 635 St. Paul St., Rochester, N. Y.—Safety eyewear frame for use by men or women workers is a combination of metal and plastic to combine the strength of metal with the adaptability of plastic. Safety features include a frame of noninflammable acetate butyrate fully cured to hold its shape, a metal bridge held to the frame with four rivets and plated to resist corrosion, and adjustable nose pads which are an integral part of the bridge. Frames are supplied in a neutral gray shade.

For More Details Circle No. 35—Page 201

Air Cylinders

develop a thrust equal to the air pressure applied

Bellows Co., 230 West Market St., Akron 9, O.—Line of small air cylinders with 1, 2, 3 and 4 in. strokes are available in double acting (air-powered advance stroke, air-powered-

retract stroke) as well as single-acting air-powered advance, spring return units. Cylinders are equipped for front or side mounting, front or rear flange mounting or front pivot mounting. All models develop a thrust equal to the air pressure applied.

For More Details Circle No. 36—Page 201

Paper Wipers

have wet strength and are packaged in "pop-up" boxes

Scott Paper Co., Chester, Pa.—Disposable industrial paper wipers are packaged in "pop-up" boxes containing 125 wipers. Two sizes of sheets are offered, 9⅝ x 13⅜ in. and 9⅝ x 10¼ in. Wipers have an embossed surface that is chemically treated to provide wet strength.

For More Details Circle No. 37—Page 201

Jig Saw

can make bevel cuts up to 45 degrees on either side

Black & Decker Mfg. Co., Towson 4, Md.—Heavy-duty jig saw has a 1-in. stroke that can cut from a depth of 2 in. at 90 degrees to 1⅜ in. at 45 degrees. The shoe can be adjusted to any angle by a calibrated quadrant. Weight is 6 lb. Line of cut is blown free of chips by a forced-air flow that cools motor and

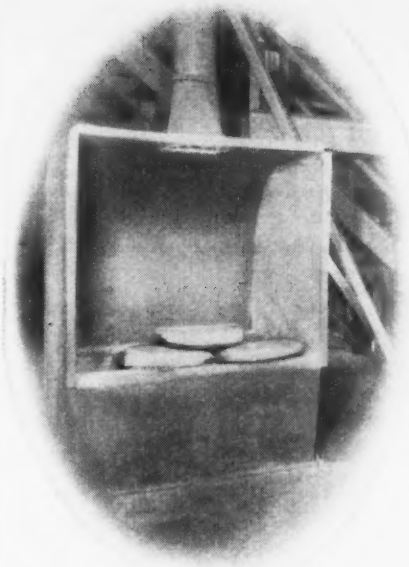
is directed through the tool housing to the cutting edge. Vibration is eliminated by a dynamically balanced reciprocating action. One metal cutting and three wood cutting blades are provided with the tool.

For More Details Circle No. 38—Page 201

Roof Repair Kit

contains necessary materials to stop winter roof leaks

Monroe Co., 10703 Quebec Ave., Cleveland 6, O.—Emergency repair kit contains heavy-bodied asbestos waterproofing, plastic patching compound, asphalt membrane and brush for use in stopping winter roof leaks. Kit is reportedly suitable for use at



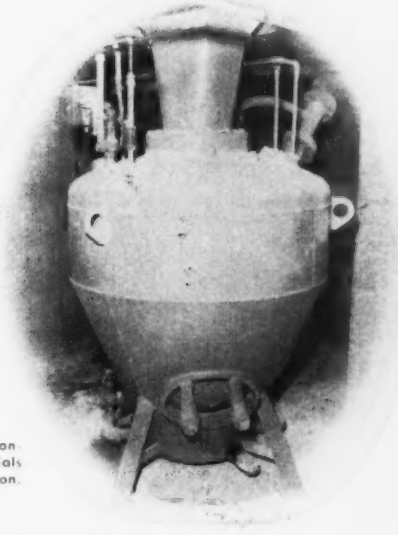
The Place...

United States Steel's new Foundry—Edgar Thompson Works

Bonding materials enter system through this bag-dump hopper above Activator.

The Job...

Pneumatic Conveying of Bentonite and Peerless Bond



Robinson Activator conveys different materials without contamination.

The Equipment...

Robinson Air-Activated Conveyor Systems

Here, as in several other leading foundries including Ford-Dearborn, Ford of Canada in Windsor, and Lynchburg, the Robinson System is proving its claims. For most dry-pulverized and fine-granular materials, it shows cleaner, more efficient, and economical handling than by mechanical or other pneumatic systems.

The Robinson System is unique in its ability to handle abrasive foundry sands, and to weigh and deliver accurate batches of sand and plastic for shell molding. The Robinson System can be made automatic as the user wishes.

If you are interested in obtaining low cost efficient handling of your sands and binders, look fully into the merits of the Robinson System. In writing, include a rough sketch of your plant and requirements. It will help us a lot in outlining our services to you.

ROBINSON Air-Activated CONVEYOR SYSTEMS

A Division of Morse Boulger Destructor Co.

80-W FIFTH AVENUE • NEW YORK 11, N. Y.

Representatives in Principal Cities

temperatures 15 to 20 degrees lower than those at which ordinary roofing materials can be applied.

For More Details Circle No. 39—Page 201

Hand Type Holders

hold interchangeable steel type for short-run setups

Noble & Westbrook Mfg. Co., East Hartford, Conn.—Hand type holders accommodate interchangeable steel type for random setup of part numbers, heat codes, date codes, etc., for hand stamping of castings, forgings and machine parts. Holder is used where parts are too large or cumbersome to bring to a marking machine or marking press or when production quantities do not warrant a machine operation. Holders for 1/16, 3/32, ⅛, 3/16 and ¼-in. type sizes can be supplied.

For More Details Circle No. 40—Page 201

Lightweight Wheels

are demountable to reduce tire replacement down-time

Nutting Truck & Caster Co., 1201 West Division St., Faribault, Minn.—Lightweight wheels for floor truck and trailer applications are of aluminum alloy in 4 to 12 in. diam in

variety of hub lengths and axle sizes. Capacity range is from 250 to 800 lb. Demountable feature permits on-the-job tire replacement to reduce down-time. Bearing rollers revolve within a hardened steel outer race and have no direct contact with the inner hub.

For More Details Circle No. 41—Page 201

Platform Truck

is moved from spot to spot by a wheeled jack and handle

Norwood Tool & Machine Co., 1952 Thomas St., Three Rivers, Mich.—Platform section is mounted on two wheels and two legs to stand in stable position under loads or under

assemblies on which work is being done. A wheeled jack and steering handle move platforms from one spot to another. A number of platforms can be employed with one wheeled jack. Platforms are 24 to 50 in. wide and from 36 to 130 in. long. Hard iron, rubber or plastic wheels can be supplied. A power lift jack also is available.

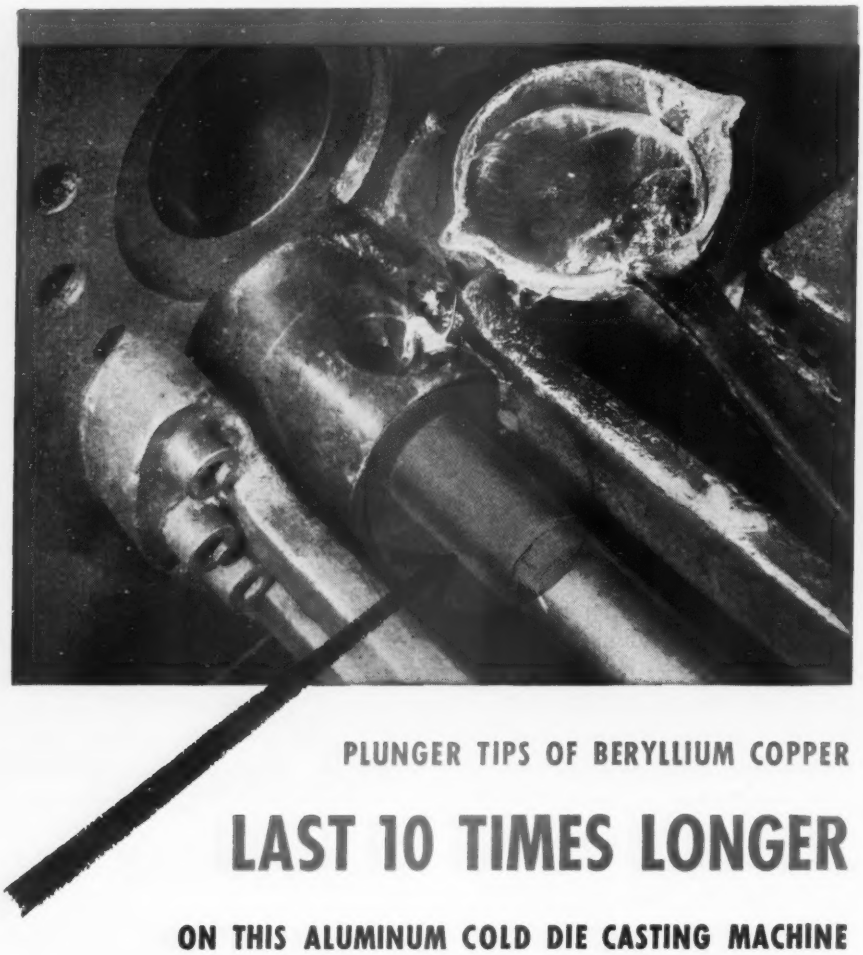
For More Details Cirlce No. 42—Page 201

Strain Gages

are resistance type for use at temperatures up to 1800° F

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.—Resistance type strain gages are for use at temperatures up to 1800° F. Gages are supplied in kits including ten gages, four types of cement with different temperature limits, detailed instructions for use and tools to simplify application. Gages consist of an etched foil grid 0.0005-in. thick on a temporary carrier which is stripped off when applying them, leaving the grid embedded in a ceramic cement. Temperature limits of the four cements are 700, 900, 1100 and 1800° F.

For More Details Circle No. 43—Page 201



PLUNGER TIPS OF BERYLLIUM COPPER

LAST 10 TIMES LONGER

ON THIS ALUMINUM COLD DIE CASTING MACHINE

The Ohio Die Casting Company, using a 2" diameter by 4" long "BERYLCO" beryllium copper tip to drive molten aluminum through a sleeve into die cavities, ran more than 51,000 cycles without a tip failure.

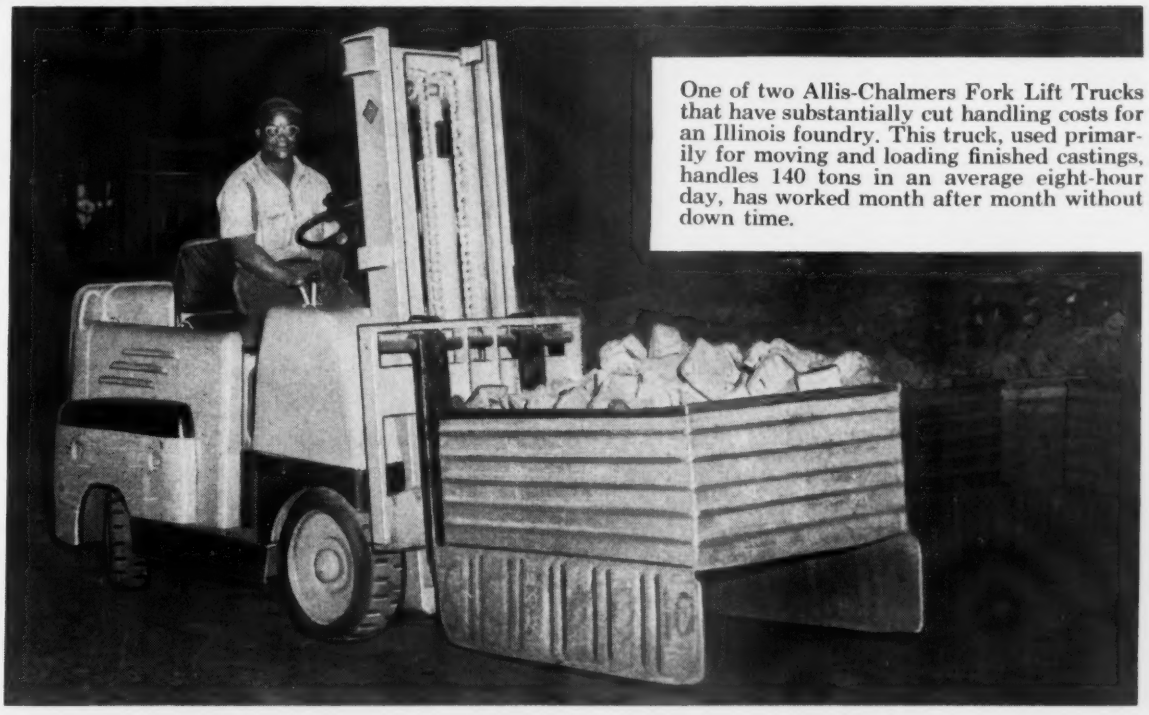
The tip of beryllium copper, turned to an initial fit of 0.0005" clearance, and subjected to constant pounding of 150-160 cycles per hour and to temperature extremes of 1200°F. aluminum and the effects of the water cooling system, operated without sticking or excessive wear. It was once used through an entire 8-hour shift without water cooling!

The advantages of "BERYLCO" beryllium copper—thermal conductivity, wear resistance, and ductility—make it the ideal metal for use in plunger tips. For specific details of this application, request Technical Bulletin #29.

THE BERYLLIUM CORPORATION
DEPT. 4-C, READING 8, PA.

BERYLCO

Allis-Chalmers Fork Lift Trucks . . .



One of two Allis-Chalmers Fork Lift Trucks that have substantially cut handling costs for an Illinois foundry. This truck, used primarily for moving and loading finished castings, handles 140 tons in an average eight-hour day, has worked month after month without down time.

stay on the job longer. . .

Reports of Allis-Chalmers Fork Trucks working thousands of hours without lost time are not unusual. Such records are not surprising, either, to those who know the long-life, low maintenance features engineered into these trucks.

Their rugged construction is typified by the all-welded, automotive-type frame — strongest used. Double-reduction axle and heavy-duty, four-pinion differential lengthen service life. Precision-built mast is a welded high-strength channel. Such features as these add up to *more time on the job.*

get back to work faster

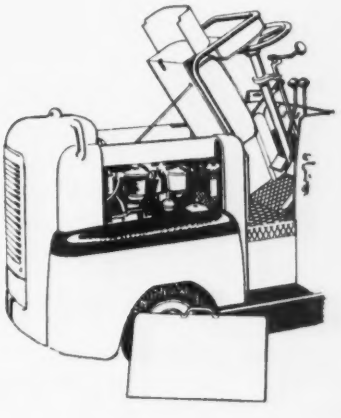
The Allis-Chalmers Fork Lift Truck is a serviceman's dream!

It takes only 22 seconds to strip for service. Lift off two side panels, tip seat forward, remove engine cowl by unscrewing two wing nuts — and everything is right there.

It takes only 22 minutes for two men to disassemble — right down to the bare frame! There are only 20 bolts and nuts to remove.

It takes only 30 minutes to change a clutch. To get at it, you simply remove the floor boards. Clutch plate is replaced without disturbing transmission or axle.

Ask your dealer to show you how Allis-Chalmers Fork Trucks make possible many bonus hours of low-cost operation.



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Patternmaking Memories–Men Who Left the Bench

Careers of Patternmakers Who Tried Other Fields

By Dewar Forbes

FOUNDRY patternmaking is perhaps the least understood by laymen of all mechanical trades. In part, this situation stems from the fact that patterns are a means to an end, not in themselves a finished product.

A patternmaker is the aristocrat of the wood working trade. Besides a well-rounded mechanical education, he requires a high degree of general intelligence. The owner of one of the principal job shops in Los Angeles said recently, "One assumes that a patternmaker is highly intelligent. That is why I treat all my score or more of employees as intelligent men . . . men who can think problems through for themselves."

The ability to think sometimes leads patternmakers to go into other work in which they feel that they can get on better. The first time I saw a patternmaker go into a different business with success occurred when I was an apprentice about 60 years ago. The pattern shop foreman, John Whitelaw, evidently thought he should have the position of manager when the post became vacant. The plant was a large steel works, one of the first to make steel in Scotland, and Mr. Whitelaw, who was of an inventive turn of mind, had designed many improvements. But a draftsman who had been in the plant only a relatively short time got the position.

So John Whitelaw left the company, after 20 years of service, and he and his wife opened a small drygoods shop, which he expanded greatly as the years went by. When some members of my family called on him 25 years later, he was retired and living comfortably on a handsome 50-acre estate.

His brother, Robert Whitelaw, who also was a patternmaker, went to Bloemfontein, South Africa, and started the first foundry there. He then branched into steel construction and erected the steel work of the first skyscraper in Johannesburg.

Arthur Maskrey was another who began life as a patternmaker, but over 30 years ago he retired as general manager of an extensive sheet steel works. He kept his ability as an expert wood worker until he died in 1936, in his middle 80s. For 60 years his hobby was making violins. He made more than 50, and some of them he presented to lead-

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AO Leggings and Spats are expertly designed from carefully selected materials to give full protection, comfort and flexibility. In chrome-tanned cowhide they are recommended against heat, sparks and hot metal flashes met with in welding, burning, cutting, pouring and furnace work. In flame-resisting duck, they protect against light sparks such as on spot welding and similar operations. Your nearest AO Safety Products Representative can supply you.

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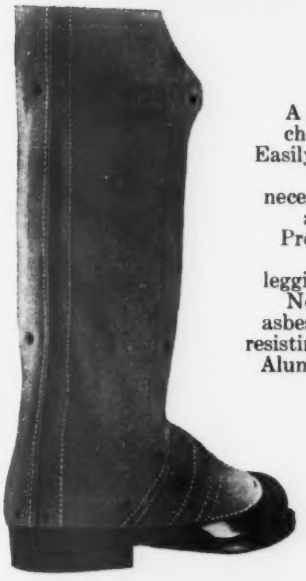
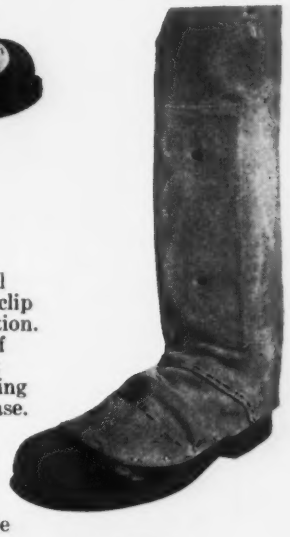


1512 Legging

A spring type legging of chrome-tanned cowhide. Easily put on and removed — no adjustment is necessary. Fits securely at ankle and below knee. Protects lower leg, ankle and instep. For same legging in asbestos ask for No. 1481; in aluminized asbestos 1481RA; in flame resisting duck it's No. 1482. Aluminized duck 1482RD.



7X160CL Legging

Chrome-tanned cowhide. Preferred because of unusual design and features. Spring clip on instep holds flare in position. Has three positions at top of legging and two positions at ankle for steel stay, permitting snug fit and immediate release. Protects lower leg, ankle and instep.

7X160A: Same in asbestos.

7X160FR: Same in flame-resisting duck. Also available in aluminized asbestos as 7X160RA and in aluminized duck as 7X160RD respectively.

7X171 Spat

Chrome-tanned cowhide with oak tanned leather flare. Snug-fitting elastic top bars entrance of sparks or molten metal into shoe tops. Three reinforcing stays keep flare snug against foot. Spat cannot curl up in hot exposures. Buckle and strap for instep. Leg portion held in place by arctic buckles in rear and two snap fasteners at top.

7X161CL Spat

Chrome-tanned cowhide — the best obtainable. Protects instep and ankle. Spring clip on instep holds flare. Three positions at top of spat and two at ankle for steel stay for snug, safe fit and immediate release.

7X161A: Same but asbestos.

7X161FR: Same in flame-resisting duck. Also available in aluminized asbestos as No. 7X161RA and in aluminized duck as No. 7X161RD.

ing violinists. After his death, several of his violins were sold for $300 each. He also was a golfer of note, and I played nine holes with him when he was 84 years old.

Charles E. Sorenson, a Danish immigrant who began as a patternmaker for Henry Ford in 1904, made or supervised the making of all the patterns for Ford's famous racer "999." Mr. Ford, and later Barney Oldfield, drove to fame in this car. Mr. Sorenson was 6 ft tall, well proportioned and always well groomed. People used to say he would have made a fine movie star. He became Ford's chief production man and earned the nickname "Cast Iron Charlie."

This writer has worked with two patternmakers who had similar experiences. One was James Dobbie, who passed away six years ago in Wales, where he was principal of New Port Technical School for 30 years. The greater part of his study for his B.Sc. degree was done while he was working at the bench. Often a highly technical man is not much of a craftsman, but Mr. Dobbie was highly skilled in both fields.

The second man was Thomas Diamond, who retired in 1950 after 30 years as head of the industrial arts department at the University of Michigan. While he was foreman of one of the pattern shops of Allis Chalmers Co., Milwaukee, he earned a scholarship at night school which enabled him to get a degree from the University of Wisconsin. Mr. Diamond is a writer of considerable note and still is chairman of the editorial board of *Shop News* magazine, of Ann Arbor, Mich.

Dr. H. E. Sotzin, head of industrial arts at San Jose State College is another former patternmaker. He was one of the first two men in the United States to receive the degree of doctor of philosophy in industrial arts. He is a colleague of Mr. Diamond's, and both were key men in getting Ford Motor Co. to award prizes to industrial arts pupils.

Wrote Book on Shop Practice

H. J. McCaslin, born on an Ohio farm in 1870, began life as a molder apprentice. But he drifted into pattern shop work, in which he finished his apprenticeship. As a journeyman he worked in the Philadelphia Ship Yards. His first book, on American shop practice, was considered an outstanding textbook on patternmaking of that time. In the early years of the century, he contributed articles to FOUNDRY and other magazines and also published his other book, *Wood Pattern Maker,* which attained a circulation of 50,000.

From 1900 to 1910, he was foreman patternmaker for Wellman Seaver Morgan Co., Cleveland, and in 1910 he was invited to join a Cleveland technical institute. Three years later, in 1913, he went to Jersey City, N. J., as an instructor at Dickinson High, and he retired in 1947 after more than 30 years of service.

R. E. Huffschmidt, president, Western Foundry Co., Portland, Oreg., is a patternmaker who had the courage to branch out in a small foundry in the wilds of Oregon, at Bend. He felt that a business could be built up in maintenance castings for a large lumber mill which had opened there.

After a few years, he acquired his present foundry, which then was in a rundown condition. After a time, Mr. Huffschmidt built the foundry into a prosperous concern. It has been expanded greatly, and its products now include many items for the lumber and paper industries. Later on, the family acquired the Industrial Iron Works, Portland, which distributes industrial castings all over the Pacific Coast.

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Thirty-five years ago the Spencer Turbo was first specified by a furnace manufacturer. Today it is the first choice of all of the leading furnace and oven manufacturers.

The reasons they prefer Spencer are the absolute reliability—perfect performance and low maintenance over long years of almost continuous service. Spencer Turbos range in size from 35 to 20,000 cu. ft. per min., 4 oz. to 10 lbs. and 1/3 to 1,000 HP. For complete description of the standard and special Turbos ask for Bulletin No. 126-A.

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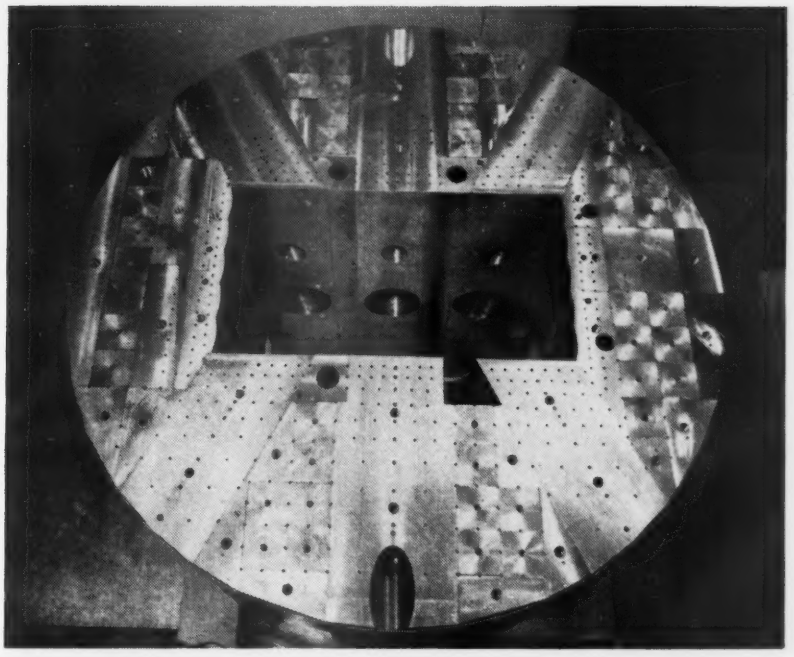
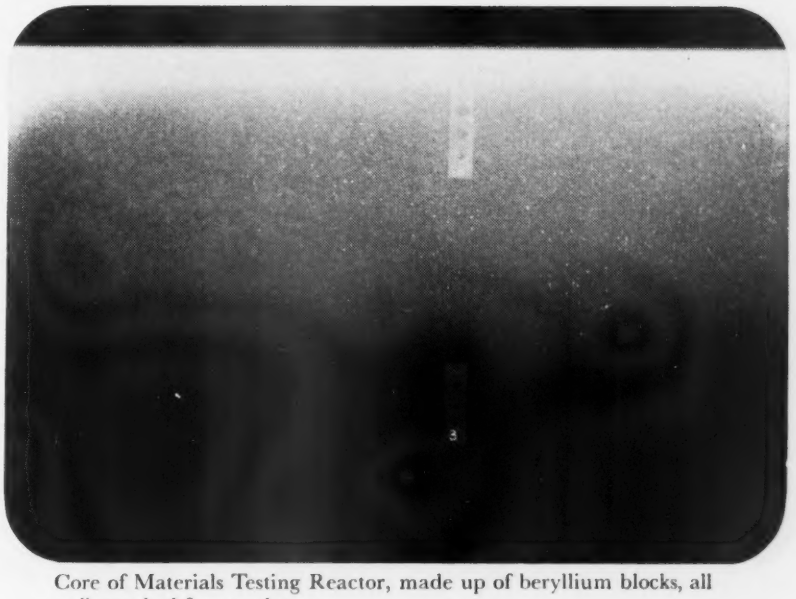


PROVED READY FOR ITS JOB



BY RADIOGRAPHY

Core of Materials Testing Reactor, made up of beryllium blocks, all radiographed for soundness.

BERYLLIUM makes an excellent moderator and reflector in a nuclear reactor. But to do its job and minimize neutron consumption by absorption, it must be especially pure and free of pockets or other faults.

Hence, the Brush Beryllium Company radiographed each block used for the core of this reactor after the beryllium powder had been compressed to form the ingot. These radiographs provided proof that no voids existed in the block, no foreign materials had slipped into the pure powder.

Proving soundness of powdered metals in this way parallels the use of radiography in the castings field. It's the sure way to know that no significant voids, gas holes or porosities exist.

If you'd like details on how radiography can work for you, get in touch with your x-ray dealer, or write us for a free copy of "Radiography as a Foundry Tool."

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TRADE MARK

makers to come to my notice is Edward Leslie, of Oakland, Calif., whose credo on "The Pattern Maker" appeared in FOUNDRY a few years ago. Mr. Leslie also contributed an article on "Propeller Patternmakers" to FOUNDRY. He also was editor of the technical column of *Pattern Maker's Journal.*

He has operated two job shops, been in the advertising business, conducted a school of painting, and been a sign painter. He still is active as a patternmaker and is checker for Pelton Water Wheel Co., San Francisco. I do not know whether he ever made a violin, but I believe he could. I do know that he draws a fine bow as a violinist. Besides these varied activities, he is busy to this day in Masonic work and is editor of his lodge bulletin.

Mr. Peter Caird, a patternmaker, operates one of the most unusual foundries in America, in Santa Rosa, Calif., out in the woods, where deer often come down into the foundry yard. I wrote an article in the June, 1955, issue of FOUNDRY which described this very attractive place.

About 25 years ago, driving through San Jose, Calif., I noticed a small building, about 15 by 25 ft, where a job shop was being operated. From it grew Reliable Pattern Works & Foundry, San Jose. The owner, James McEwan, a San Francisco patternmaker who a few years before had come down to work in San Jose, had the courage to start up a job shop in a place which at that time was doing very little manufacturing. Mr. McEwan now has a complete plant consisting of drafting room, pattern shop, foundry and machine shop. Products of his plant include a line of wood-working tools, sanders, saw sharpeners and the like, and they have attained a wide distribution.

In August, 1955, a shell molding foundry, Pacific Alloy Engineering Corp., was opened at El Cajon, Calif., 12 miles from San Diego. Vice president and general manager is Walter H. Dunn, formerly superintendent, Solar Aircraft Corp., San Diego. Mr. Dunn is a patternmaker and has had the administrative offices of the plant finished in fine woodwork. The company produces a line of intricate stainless castings for the airplane industry. The main foundry is a substantial, fireproof building, and every accommodation is provided for the comfort of employees.

Among patternmakers who have gone places Vaughn Reid, president, City Pattern Foundry and Machine Co., Detroit, stands out prominently. Born in Dundee, Scotland, and educated at Science and Art Technical School, in his home town, Mr. Reid in 1913 started a small job shop with two employees. His present plant employs more than 300 men and is outstanding in its line.

Since its beginning, a foundry devoted expressly to the production of

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—Avoid Underheating, Overheating of Metals

Use Marshall Enclosed-Tip Thermocouples to measure the temperature of all three of your molten metals—brass, aluminum or magnesium—and thus make certain your melts are poured at just the right heat! Marshall Thermocouples report metal temperatures quickly and dependably. They aid in eliminating casting flaws, and sound, strong, dense castings result.

The use of Marshall Thermocouples also speeds casting operations and lowers production costs. They eliminate the misruns, cold shuts, sponginess, and excessive shrinkage caused by underheating or overheating the metals. Rejects are minimized and the scrap pile diminishes. Write for descriptive literature.

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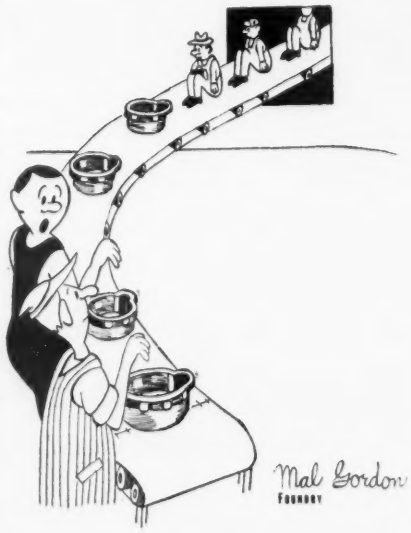

"Must be quitting time!"

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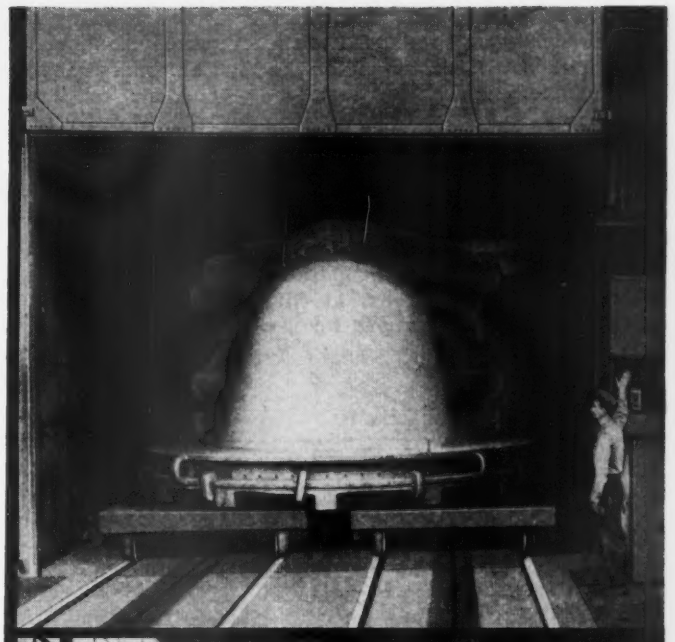
OVENS for every baking requirement

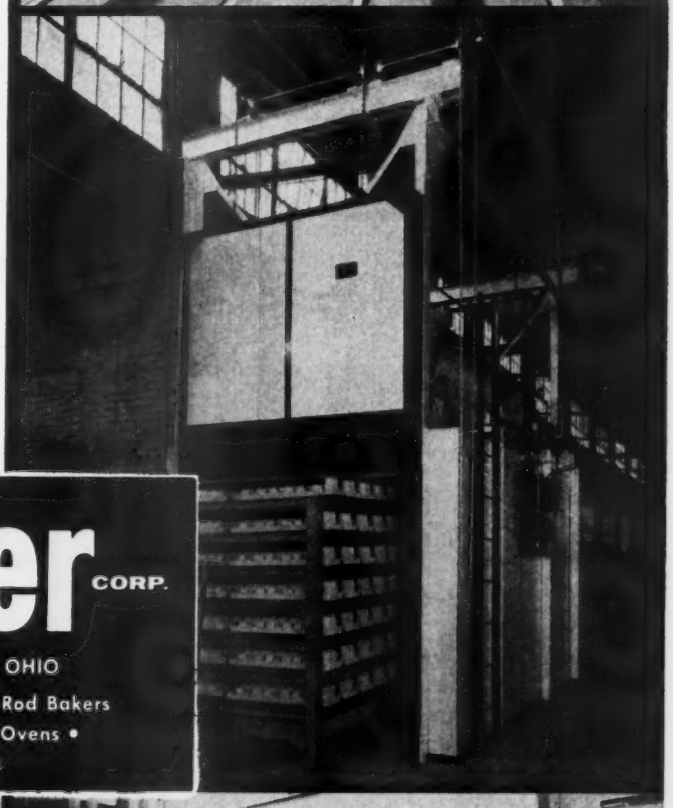
OVENS that will be faster and less expensive to operate

OVENS that are designed to best fit your operation

Carl Mayer designs and manufactures all types of ovens as well as "specials" to meet unusual operating conditions. Most incorporate the Carl Mayer recirculating heating system with sealed combustion chamber that keeps gases from prematurely escaping into the load area. Cores and molds are baked evenly with no burning. Temperatures are always under control.

Write for Bulletin 53-CM





TOP RIGHT—This large car type mold oven is installed at Pittsburgh Steel Foundry. Its patented triple slotted panel construction reduces heat loss 1/3. Fuel savings up to 50% over old conventional methods are possible. Drying time is often cut in half and temperatures are uniformly controlled.

MIDDLE RIGHT—This rack type core baking oven is at the Fremont Foundry Co., Fremont, Ohio. It is equipped with a recirculating combination gas-oil fired heating system.

BOTTOM RIGHT—Vertical Core Oven (unloading position) at A. C. Williams Company, Ravenna, Ohio. This oven is 11'-0" wide x 11'-0" deep x 45'-0" high.

BELOW—Our standard rolling drawer type core baking oven. The heating equipment (not shown) may be mounted on floor beside unit or on the roof. Particularly adaptable to brass and aluminum foundries.

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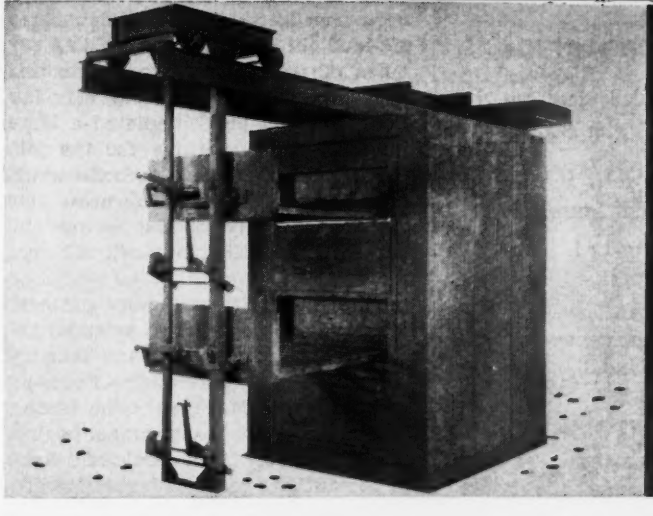
OTHER PRODUCTS: Heat Treating Ovens and Furnaces • Rod Bakers • Welding Rod Ovens • Paint and Ceramic Drying Ovens • Special Processing Equipment and Accessories



nonferrous castings and a modern machine shop have been added to the plant. Unusual laboratory facilities are available, and a skilled engineering service is maintained.

No article of this nature would be complete without mention of the late H. A. Snow. He began life as a patternmaker, but switched to the foundry and finished his apprenticeship there. As a boy and a young man, he displayed great interest in wild life in the forests. He longed for the day when he might be able to go big-game hunting.

He worked for some years as a journeyman molder and was one of California's representatives to the molder's convention in Toronto, in 1902. But he began to feel that it would take him too long working as a molder to be in a financial condition to go big game hunting. Accordingly, he left the foundry, (Graham's at Newark, Calif.) and tried his hand at a number of lines of endeavor.

He was at various times a livery stable owner; a hay, grain and feed dealer; an automobile agency owner; and the promoter of a baseball club.

Finally, in 1919, Mr. Snow set out for Africa. He returned in 1922 with 125,000 ft of wild-life film and the largest and most complete collection of animals, birds and insects to come out of Africa up to that time. He also made a movie called "Hunting Big Game in Africa," which he sold to Universal for $300,000. He then went to the Arctic, and when he returned, Fox bought his picture "Hunting Big Game in the Arctic" for $200,000.

After an extended lecture tour, on which he met the late Theodore Roosevelt and others interested in big game, he gave his entire collection of wild life to the city of Oakland. An outright gift, it was valued at $1 million. This collection is housed in the Snow Museum, Oakland. Mr. Snow died in 1927 at 57 as a result of a disease contracted in Africa.

Manufactured Earthmoving Equipment

Another Oakland foundryman has had a remarkable career. G. Le Tourneau, former president of the great earthmoving equipment plants at Peoria, Ill., and Longview, Tex., planned as a boy to be a patternmaker. There was, however, no such opening at the time in the Judson Iron Works, Oakland, and he went into the foundry and became a journeyman iron molder.

As an outlet for his yearning to manufacture, he opened a garage and repair shop in Stockton, Calif. He began the manufacture of road-building machinery and did considerable road building. Soon, so many contractors wanted him to supply equipment that he quit road building and set up his first factory in Stockton. About this time he invented the famous bulldozer. In 1935, he moved his factory to Peoria and in 1945 established the Longview factory.

Recently he has gone into road building again. The government of Peru has deeded him 1 million acres of land in return for building 31 miles of road through a jungle and over mountainous territory. Mr. Le Tourneau has just completed a huge jungle-clearing machine for the job. He also has a contract to build roads in Liberia. Mr. Le Tourneau has given generously of the fortune he has made to religious work all over the country.

Through the years many patternmakers have contributed splendid articles on patternmaking and foundry work generally to both FOUNDRY and *American Machinist*. The writer, like many other patternmakers, has clip sheets of these articles. Some of the authors come to mind: Messrs.

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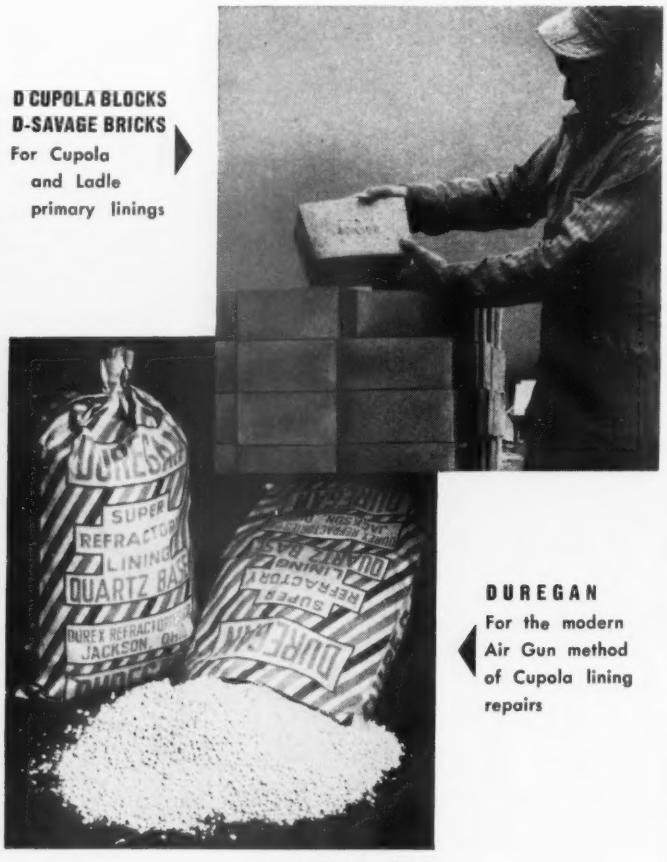

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Both the primary lining and the modern air placement repair material, can be furnished from our plant in the same carload. Our ability to furnish *both* of these distinctly different products from the same plant, enables individual foundries to minimize their inventories without necessitating l.c.l. shipments at higher costs.

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McCaslin, Gard, Duggan, Leslie, Raebeg, Shaw, Edgar, Cook and others.

In closing this article about patternmakers who have gone into other lines of endeavor, I should pay tribute to the many men who spent a lifetime at the bench. For instance, Paul Lican, born March 23, 1872, still is working at the pattern bench at Allis Chalmers in Milwaukee, in one of the largest pattern shops in America.

Another man who comes to mind is Charles Dobbie, once a foreman of mine and father of James Dobbie, who was mentioned earlier. Although he was foreman in a shop employing from 12 to 20 men, he worked at the bench himself and did most of the checking. He had been apprenticed at cabinetmaking, but changed to patternmaking in 1860. From the first, he took a keen interest in every development in the foundry.

Mr. Dobbie was born in 1840 and died in 1928, within a month of his 88th birthday. He had retired four years before his death after 40 years as foreman at Speedwell Iron Works, Coatbridge, Scotland.

Aluminum Association Elects Officers at Annual Meeting

Everett G. Fahlman, president, Permold Co., Medina, O., was re-elected president of the Aluminum Association at its annual meeting in January. In addition to his outstanding contributions to the aluminum industry, Mr. Fahlman has been active in public service. He was a member of advisory committees to the War Production Board, the Industrial College for the Armed Forces, the National Production Authority and the Office of Price Stabilization. He also was deputy director and acting director of the Aluminum-Magnesium Division, Business and Defense Services Administration.

Arthur V. Davis, chairman of the board, Aluminum Co. of America, was re-elected chairman of the board, and the following association vice-presidents also were re-elected: L. M. Brile, president, Fairmont Aluminum Co., Fairmont, W. Va.; Frank B. Cuff, Aluminum Co. of America, New York; and George N. Wright, general manager, Harsch Bronze & Aluminum Foundry, Cleveland.

In the Foundry Division, J. Frank Seeley, sales manager, Casting Division, Bohn Aluminum & Brass Corp., Detroit, was re-elected chairman, and O. L. Earl, president, Acme Aluminum Foundry Co., Chicago, was re-elected vice chairman. George N. Wright also was elected division representative on the association's board of directors.

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Avoid smashed fingers, broken hands and other serious and costly accidents with Taylor Chain's new Alloy Steel Tayco Hooks. Patented I-Beam type design provides a safe gripping channel for the hooker's hand ... increases the strength and life of the hook immeasurably.

Large area above the eye further increases the hook's life. Oversized eye reduces joiner link wear. Drop-forged from Alloy Steel and heat-treated—Tayco Hooks have great resistance to shock, grain-growth and work-hardness at all temperatures. Available separately and as standard equipment on all Taylor Made Alloy Sling Chains.

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Book Review

Principles of Metal Casting, by Richard W. Heine and Philip C. Rosenthal, cloth, 639 pp., 6 x 9 in., published by McGraw-Hill Book Co., New York. Price $7.50.

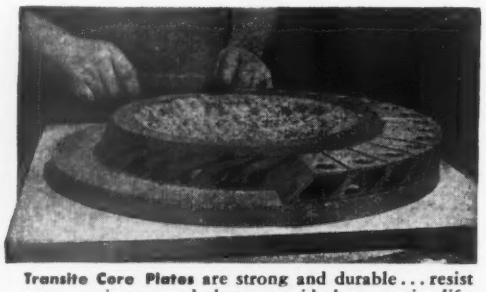
This volume, prepared in co-operation with the textbook committee of the Education Division, AFS, offers a double-barreled usefulness. It is intended to be used for two different college courses at the beginning level of instruction in metal casting. One course is for metallurgical engineering students and requires major emphasis on the metallurgical engineering aspects of foundry processes and materials. The entire text can be used for reading assignments in instructional time amounting to two 1-hour lectures and one 3-hour lab period per week for 16 weeks.

For mechanical engineering students, the course work is aimed at a survey of the principles of foundry processes and the proper utilization of castings for engineering purposes. For this purpose, only certain chapters, as listed in the book, are used as reading assignments for a course with one 1-hour lecture and 2 hours of laboratory work per week for 16 weeks.

Much of the material and the manner in which it is presented is new to foundry textbooks. Although the work does not attempt to be an advance treatment, it manages to cover a great deal of territory and also offers, at the end of every chapter, an extensive reference list for further reading. Illustrations and tables are used profusely.

Both authors are well known to foundrymen and are members of the University of Wisconsin Department of Mining and Metallurgy.

Cut foundry operating costs . . .



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"Johns-Manville Transite* Core Plates help assure maximum production in minimum time"—that's the experience of foundrymen who have used them for years. Made of asbestos and cement, they are light in weight, yet strong and durable. Being non-metallic, they resist corrosion, maintain their smooth surface and can be easily cleaned.

Transite Slip Jackets are a companion product with similar advantages. They do not burn, retain their original shape despite runouts. Slip jackets are furnished in both white and black types. The latter is widely used as a protective liner for metallic slip jackets.

FREE . . . New Folder gives complete details on Transite Core Plates and Slip Jackets—as well as Transite Pallite products for dielectric furnaces. For your copy of folder PP-31A, write Johns-Manville, Box 60, New York 16; in Canada, 565 Lakeshore Road East, Port Credit, Ontario.

Transite Slip Jackets cost less than other types . . . last longer, too. Result—important savings for foundries.

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Johns-Manville TRANSITE CORE PLATES AND SLIP JACKETS

Material Handling Committee Develops Film on Conveyors

A new material handling educational film on conveyors is being developed by the College-Industry Committee on Material Handling. "Powered Industrial Trucks," first in the series of educational films to be sponsored by the committee, was released in the fall of 1954.

The new film is planned to enable one to recognize basic types of conveyors and their applications. As a part of the material handling industry's educational program conducted in co-operation with colleges, the film will be suitable for college classroom use as well as for industrial purposes. It probably will be available early in 1956.

The committee is sponsored by the Material Handling Institute Inc. and the American Material Handling Society. Members include engineering college faculty members and users and manufacturers of material handling equipment.

Investment Casting Institute Sets Up Nine New Committees

Nine new committees have been established by the Investment Casting Institute, Chicago. They include the following groups and their chairmen:

Research, K. W. Thompson, K. W. Thompson Tool Co.; national safety, R. S. Banister, Midwest Foundry Co.; industry blue book, R. R. Miller, Precision Metalsmiths Inc.; wage survey, Harold Hanssen, Howard Foundry Co.; cost study, Freeman Jones, Misco Precision Casting Co.; market research and statistics, P. W. Schipper, Howard Foundry Co.; university liaison, Ted Operhall, Misco Precision Casting Co.; sales clinic, Nelson Spoth, Kolcast Industries Inc.; as well as a committee on heat treatment.

Obituary

RUSSELL J. ANDERSON, 60, director of manufacturing, Belle City Malleable Iron Co. and Racine Steel Castings Co., Racine, Wis., died Jan. 20. Associated with the company for 35 years, he supplemented his foundry experience with engineering courses at night school and university extension classes. Mr. Anderson

Russell J. Anderson

served as president of the Wisconsin Chapter of the American Foundrymen's Society during 1947-48 and in recognition of his contributions to the foundry industry was awarded the Peter L. Simpson Medal of the AFS in 1949.

Thomas E. LaMondy, 75, former superintendent, O P W Corp., Cincinnati, died Jan. 15 in Elkhart, Ind., where he had lived since his retirement in 1948. Mr. LaMondy was associated with Johnson Bronze Co., New Castle, Pa., and spent many years with Adams & Westlake Co., in Chicago and later in Elkhart, when the plant was moved there. Prior to joining O P W Corp. in 1945, he was with Ertel Mfg. Corp., Indianapolis.

Thaddeus J. Kaczmarowski, 44, employment manager, Maynard Electric Steel Castings Co., Milwaukee, died Jan. 20. He was associated with the company for 20 years.

Elmer O. Bischoff, 53, assistant secretary-treasurer and controller, Grede Foundries Inc., Milwaukee, died Jan. 27.

Charles J. Hardy, 89, former president, American Car & Foundry Co., now ACF Industries Inc., St. Louis,

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Pioneered in 1948, and backed by over 60 years' experience in the manufacture of abrasives, Tru-Steel Shot was the original High-Carbon Fully Heat-Treated Steel Shot of Tool Steel Quality!

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And Tru-Steel is now packaged in 50-lb. double burlap bags — the finest packaging ever devised for metal abrasives — lighter, easier to handle, easier to stack, not slippery like slick, hard-surfaced cardboard cartons.

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Subsidiary of Pittsburgh Crushed Steel Co.
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Automatic MONORAIL

Delivers 25 Tons Daily

One man uses push-button control to load, automatically dispatch, over four tracks, and dump fresh core sand at any of 24 stations.

This flexible American Monorail System is tied in with manually operated track switches. Stations may be increased to 16 per track.

This American Monorail installation is typical of hundreds which have sharply cut handling costs.

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MONORAIL COMPANY

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died Jan. 17. Mr. Hardy was president of the company from 1933 to 1944, and chairman of the board until 1951.

Raymond E. Dunham, 71, for 25 years president of the Dunham Co., Berea, O., died Jan. 22. Mr. Dunham attended Baldwin-Wallace College and joined the family concern 50 years ago, serving as salesman, plant manager and president.

William H. Gehring, 81, president, Brass Products Co., Detroit, died recently. Active in the foundry industry for 60 years, he was one of the founders of Brass Products Co. in 1910.

Directory Describes Services Of Independent Laboratories

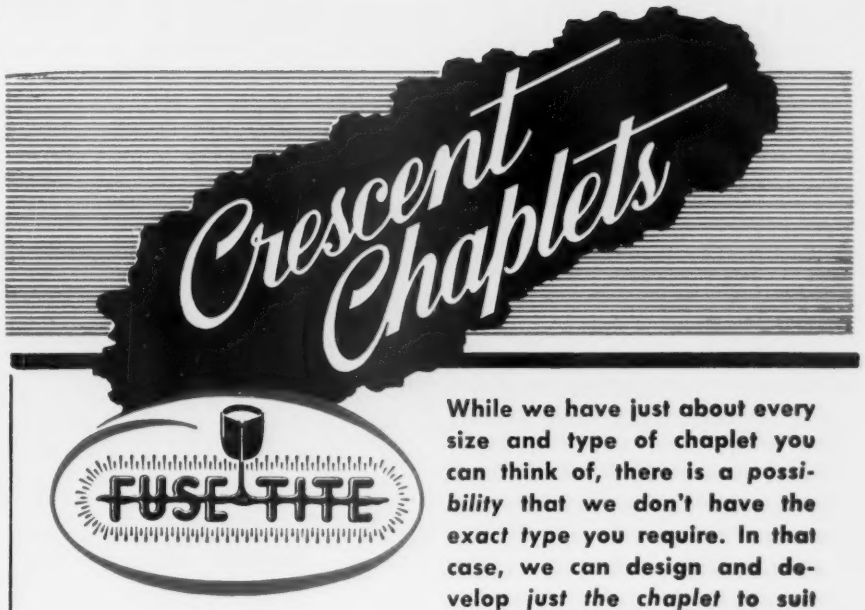
The American Council of Independent Laboratories, Washington, has issued the 1956 edition of its *Directory*. In addition to scope sheets for 67 member laboratories, the new edition includes an extensive index to their services and facilities. The index of services lists over 400 categories which the membership offers.

The council is a professional association of independent scientific laboratories. It has 67 research, testing and inspection laboratories, with 65 branches located in chief metropolitan centers of the country. Copies of the directory are available without charge from H. M. Dudley, executive secretary, American Council of Independent Laboratories Inc., 4302 East-West Highway, Washington 14, D. C. Write on company letterhead.

Offers Data on Titanium

A supplement to *Constitution of Titanium Alloy Systems* (PB 111508, 261 pp., $8) has been issued by the Office of Technical Services, U. S. Dept. of Commerce. Representing information available from February, 1953, to September,1954, the supplement bears the same title and compiles and evaluates new information on 31 binary and 39 ternary systems, including crystal structures.

Phase diagrams are presented in alphabetical order according to the chemical symbols of the elements added to titanium. Presentations are standardized for ease of comparison of the systems. The new publication is PB 111508s and costs $4. It contains 155 pages. Both it and the original are available from OTS, U. S. Dept. of Commerce, Washington 25, D. C.



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- **DOUBLE HEAD CHAPLETS**
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  Regular or Extended Stems
- **TIN TUBES**
- **CHAPLET NAILS**
  Plain, Nicked or Barbed
- **SKIM GATES**
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Pacific Coast Foundries Set a Fast Pace

Kaiser, Graning, Rich and Commercial advances are typical of important strides in foundry mechanization in West Coast plants

One of the most modern ingot mold foundries in this country — that of Kaiser Steel Company at Fontana, California — uses a Motive Speedslinger to ram both molds and cores. Ingot molds weighing up to 30-tons are produced. Kaiser has also recently completely modernized its sand preparation facilities. One Model "80" Speedmullor prepares all of the molding sand for Kaiser's ingot mold foundry.

The Graning Enameling Company, producer of enameled sanitary ware is really proud of the quality of their castings. In a field where castings must be extra-smooth and defect-free, Graning has built a reputation for top quality. To get that quality, Graning rams all of their molds with a Sandslinger and mulls all of their sand with a Speedmullor.

Few foundries have reached the degree of mechanization and automation as has the Rich Manufacturing Company of California in their Los Angeles plant. Their molds for soil pipe are produced on one of the most advanced lines in the country at the rate of one mold per minute. A B & P Swingslinger does all of the ramming and a Speedmullor prepares all of the molding sand to exacting specifications.

When the Commercial Enameling Company of Los Angeles wanted top foundry production to meet the increasing demand for their line of sanitary ware, they turned to B & P equipment and installed a B & P Slinger-Roto-Mold Unit with B & P Rol-A-Draw machine. This new unit rams all of their molds at a man-hour-rate-per-ton-of-castings of less than half of that of the old method.

These four foundries are just a few of dozens of progressive West Coast plants that look to Beardsley & Piper for Better Methods.

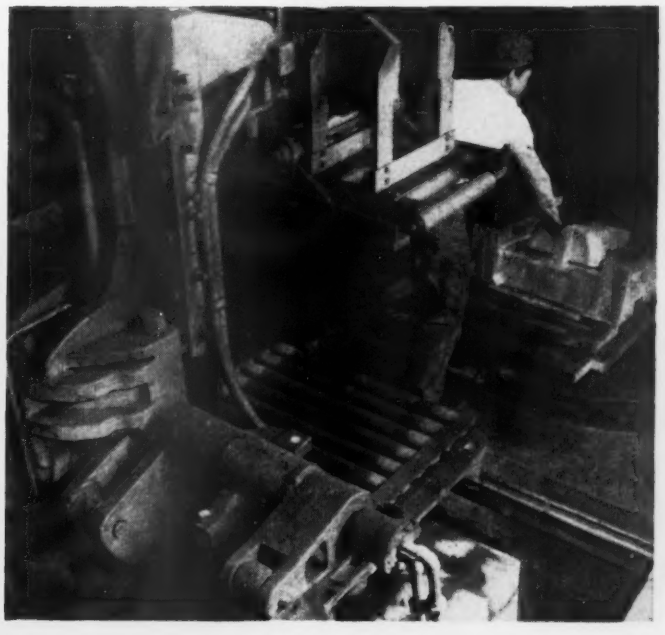
INGOT MOLDING AT KAISER, like that of virtually all ingot mold plants is handled by a Speedslinger. At Kaiser, they use a single Motive Speedslinger to ram both molds and cores for ingot mold castings weighing up to 30 tons. A B & P Model "80A" Speedmullor prepares all of this foundry's molding sand.

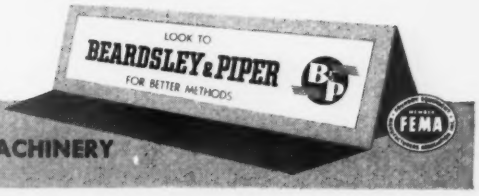
SANITARY WARE MOLDING AT GRANING is no longer a hard, time-consuming manual operation. A Model "60A" Speedmullor prepares all of the molding sand. A B & P Sandslinger-Roto-Mold Unit is used for the major portion of the foundry's molding. A 60% improvement in man-hour efficiency has been obtained with this equipment.

BEARDSLEY AND PIPER DIVISION PETTIBONE MULLIKEN CORPORATION
2424 NORTH CICERO AVENUE • CHICAGO 39, ILLINOIS

PIPE MOLDING AT RICH is handled on one of the most modern installations of its type ever made. Manual operations have been eliminated and every step is automatically accomplished. A B & P Automatic Swingslinger (enclosed at right in the photograph above) rams all molds assuring perfect uniformity on mold after mold. A single Model "80" Speedmullor prepares all of the molding sand for this operation.

COMMERCIAL GETS TOP PRODUCTION on a great variety of different patterns with their new Slinger-Roto-Mold Unit. Cope and drag patterns are mounted on the same pattern board. A single B & P Rol-A-Draw machine handles the rollover and draw of all molds made on the unit.

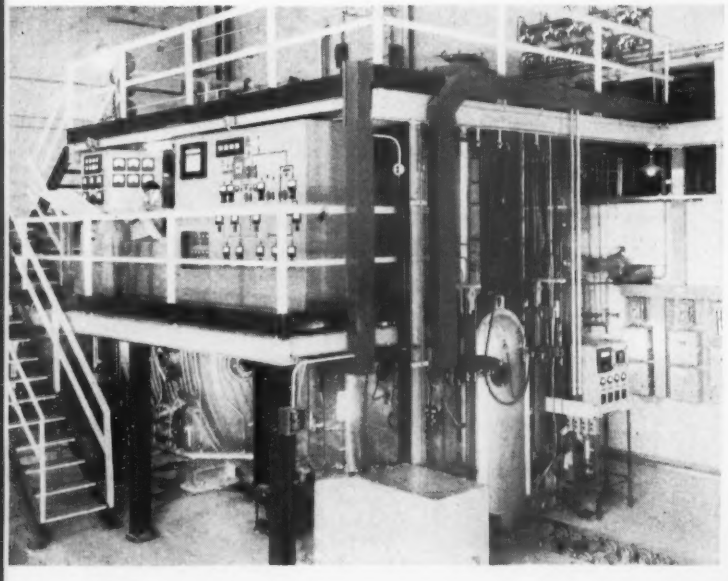




THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF FOUNDRY MACHINERY

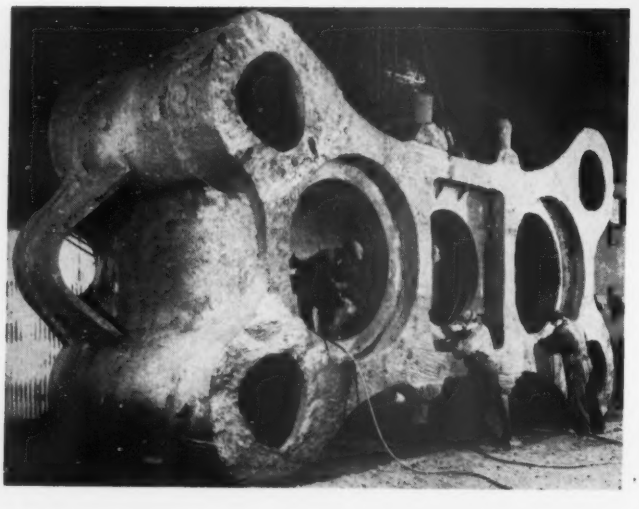
News Views

TITANIUM PLANT: America's first titanium sponge plant using the sodium reduction process is being built at Ashtabula, O. Construction has been under way for a year. This new plant will mark the entry of Electro Metallurgical Division of Union Carbide & Carbon Corp., into sponge titanium production. When it is completed, an estimated 7500 tons of sponge will be manufactured anually. It is anticipated that production will begin in the third quarter of 1956



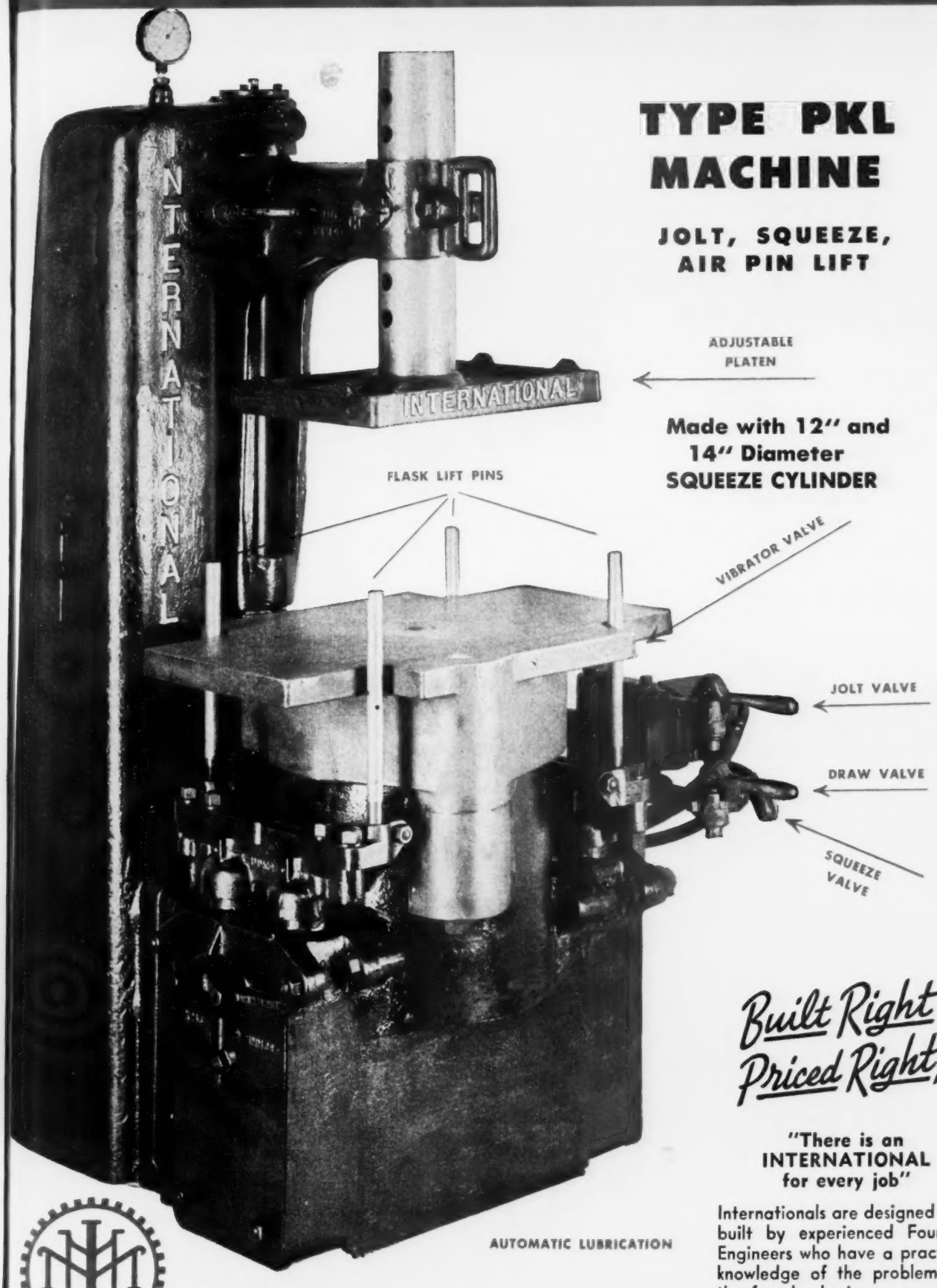
LARGE FURNACE: Vacuum Metals Corp., Syracuse, N. Y., recently tapped the nation's largest vacuum melting furnace. Of 2200 lb capacity, the furnace is operated remotely by the melter, who can control from one console the charging, mold transfer and pouring operations. Melting unit is enclosed in a ¾-in.-thick, air-tight and liquid-cooled stainless steel chamber, with connecting air lock chambers for charging raw material and discharging ingots. Design makes it possible to charge, melt, pour and remove ingots without affecting the vacuum in the melting chamber. Ingots of varying shape and size can be cast singly or in multiples

STUDENT AID: Howard B. Nye, Shrewsbury, Mass., left, outgoing president, New England Foundrymen's Association, is shown presenting the organization's check for $1000 to T. P. Petre, director, the Student Aid Center, Massachusetts Institute of Technology, Cambridge, Mass., to help finance education of metallurgy students. In center is Albert M. Nutter, Brockton, Mass., newly elected president of the association



GIANT CASTING: Six furnaces were necessary to produce the steel required for the large casting shown at left. Casting measures 28 ft 6 in. long x 14 ft 2 in. high and 8 ft 6 in. wide. It will be used as a base for a forging press. In size, the casting was the largest ever poured at the English Steel Corp., Sheffield, Yorkshire, England. It measures 2 ft longer and 1 ft higher (although weighing 19 tons less) than a similar casting made for a U. S. firm in 1953. Workmen are smoothing some rough spots on the 166-ton casting

INTERNATIONAL



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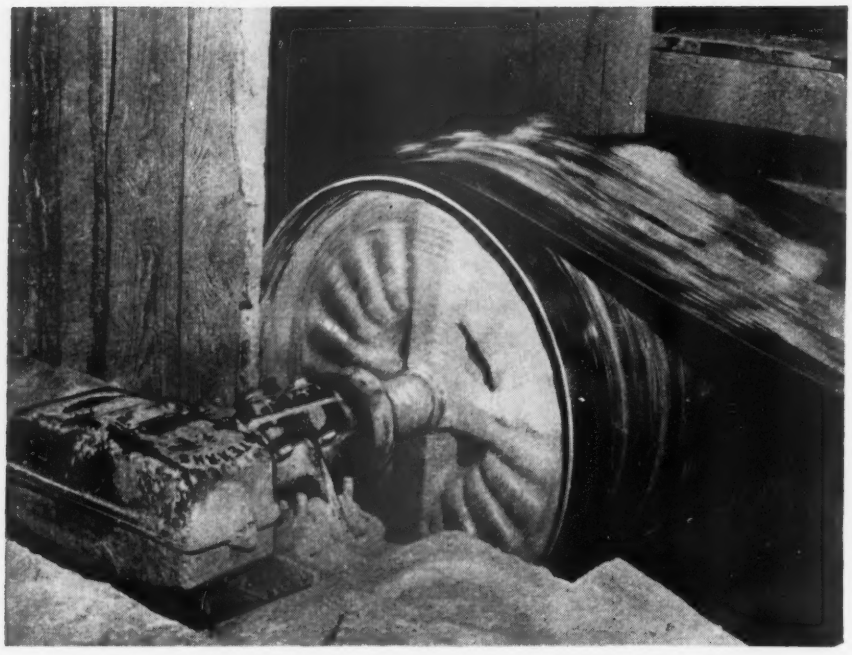

New magnetic pulley stops tramp iron riding the load peaks

Diagram showing magnetic field for 2-coil, 36-in.-dia., 42-in.-wide pulley. Note how magnetic field blankets entire load.

This new Stearns 2-coil electromagnetic pulley effectively removes tramp iron riding the crest of a conveyor load as well as the pieces that pass close to the magnet's face. Two-coil design produces a powerful magnetic field that is deepest at the center of the conveyor belt where load is heaviest. Thus, the area of magnetic attraction is the same general shape as the load on a conveyor operating under standard conveyor practices.

Smaller, lower-cost pulleys now practical

Because of the nature of the magnetic field, smaller pulleys costing less can now be used on jobs where larger units were formerly needed. An examination of data on a number of proposed installations showed that, in the majority of cases, the recommended new 2-coil pulley was of smaller diameter than a 3-coil pulley of comparable ability.

New, simple pulley selection method*

Because this pulley fits right into recommended conveyor standards for speed of belt travel and depth of load for various types of materials, it is far simpler to select the right pulley than ever before. Stearns provides new selection tables in Bulletin 303-C that now make it possible for you to select the right size unit for your job even before you consult our sales engineers.

Get all the facts on this new magnetic pulley. Find out how it simplifies pulley selection. Write for Bulletin 303-C.

*Copyright 1954, Stearns Magnetic, Inc.

1147

MAGNETIC EQUIPMENT FOR ALL INDUSTRY

STEARNS MAGNETS

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How Employees Can Help Your Public Relations

Organize a Program for Employee Co-operation

By Alfred M. Cooper

IT IS customary to consider office employees — clerks, receptionists, telephone operators and salesmen— as builders of good will in the community in which a plant is located. These people usually are trained in the proper methods of meeting the public.

But what about the aggregate effect on a plant's public relations of after-hour contacts made by *all* the employees of any plant with their friends and neighbors?

An instance of the awful power of unfavorable employee publicity: A company spends thousands of dollars in an honest effort to convince the citizens of its community that it not only manufactures a superior product, but that its plant is a good place to work.

But suppose an important number of the employees of that plant should at the same time be telling their friends that they are working in a madhouse? Day after day, and particularly night after night, this thoughtless, unfavorable exaggeration is disseminated. Will the public believe the favorable publicity of the company, or will they attach more weight to the apparent low-down straight from the mouth of a fellow who works there?

Here is what often happens: The employee is asked questions about his plant and its policies. He doesn't know the answer, but he doesn't like to admit it. So he makes up a story, perhaps never realizing how bad he makes the company look. Until organized effort is made to direct the employee's after-hour contacts much damage can be done by employees' loose talk.

Insuring that employees will present uniform and truthful reports regarding conditions in their plant to their friends is essentially a training job. Issuing printed or mimeographed brochures will not do the trick, for you have no way of knowing whether an employee can or will absorb the information thus presented to him. Neither can you be sure that he will pass on this accurate information to others, outside of working hours.

Any program of public relations

training has two phases. First, employees must be informed specifically concerning vitally important policies of management which can affect public attitude most favorably.

Second, employees must be *taught* how best to pass out this information when someone asks questions or in the course of a friendly discussion. Under these circumstances, the recipient is least likely to be resistant to new and favorable ideas. All information given employees must be 100 per cent accurate.

This information should be discussed in a conference which the employee attends with his fellow-workers, a conference conducted by the immediate supervisor of the group. A conference should be scheduled for all employees once or twice a year —whenever some important matter of policy needs to be given the widest possible publicity. After the discussion, each employee should be furnished with printed matter for reference.

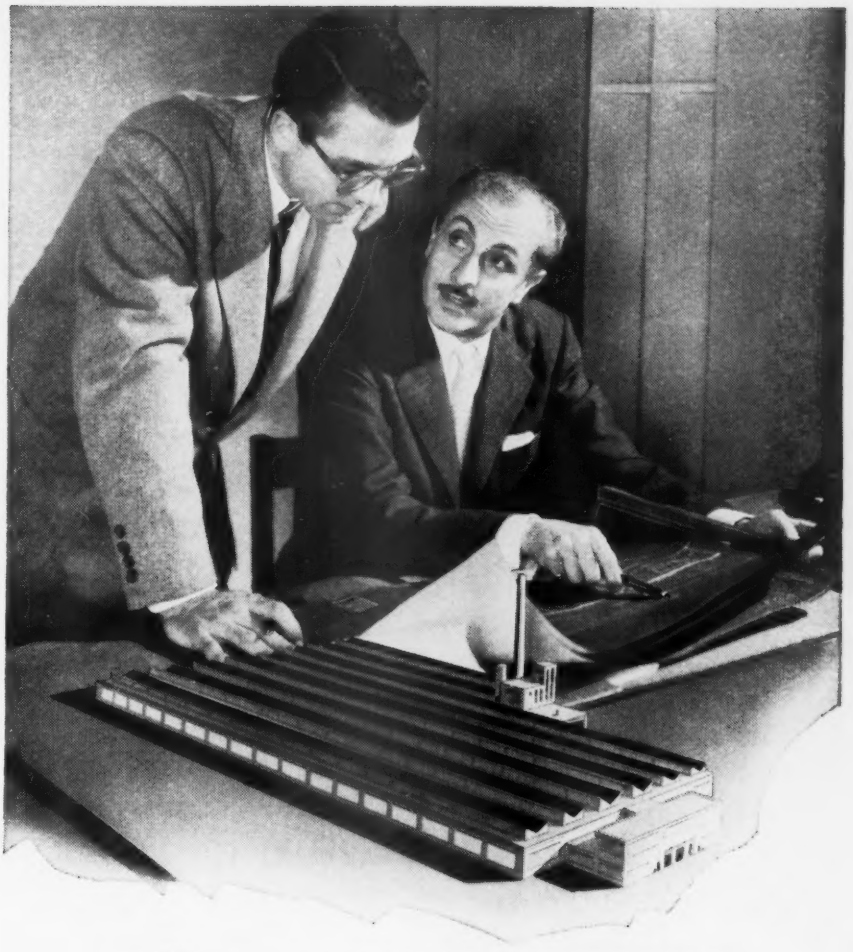
Make Good Discussion Leaders

Good foremen and assistants always make good discussion leaders, even when they are not good public speakers. The best way to train anyone to lead worthwhile conferences is simply to let them lead conferences. Foremen ordinarily need no special training for this job.

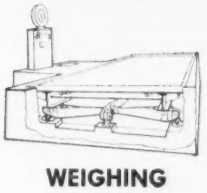
At its inception, any such program always is met with a certain amount of skepticism by employees. This attitude is natural, and these people must be convinced that the project is sincere. Thereafter, they learn that management is going to some trouble to inform them of what is going on at the policy-making level. (They like this.) Finally, they must experience for themselves the satisfaction of being able to answer truthfully and authoritatively any questions put to them by acquaintances—people who do not work for the company.

Management must determine what information justifies this method of getting facts over to the public. Anyone who has studied a group's public relations can recall many instances in which such unusual methods of publicizing matter of policy would be justified. In general, I know of no subject that should be taboo other than matters intended to influence employees about union affiliation.

The mechanics of an informational training program are simple. When management decides that certain information should reach the public

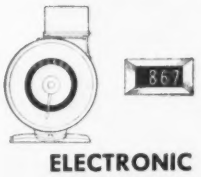


When you STUDY COSTS it pays to take a plant-wide look at WEIGHING



WEIGHING

COUNTING



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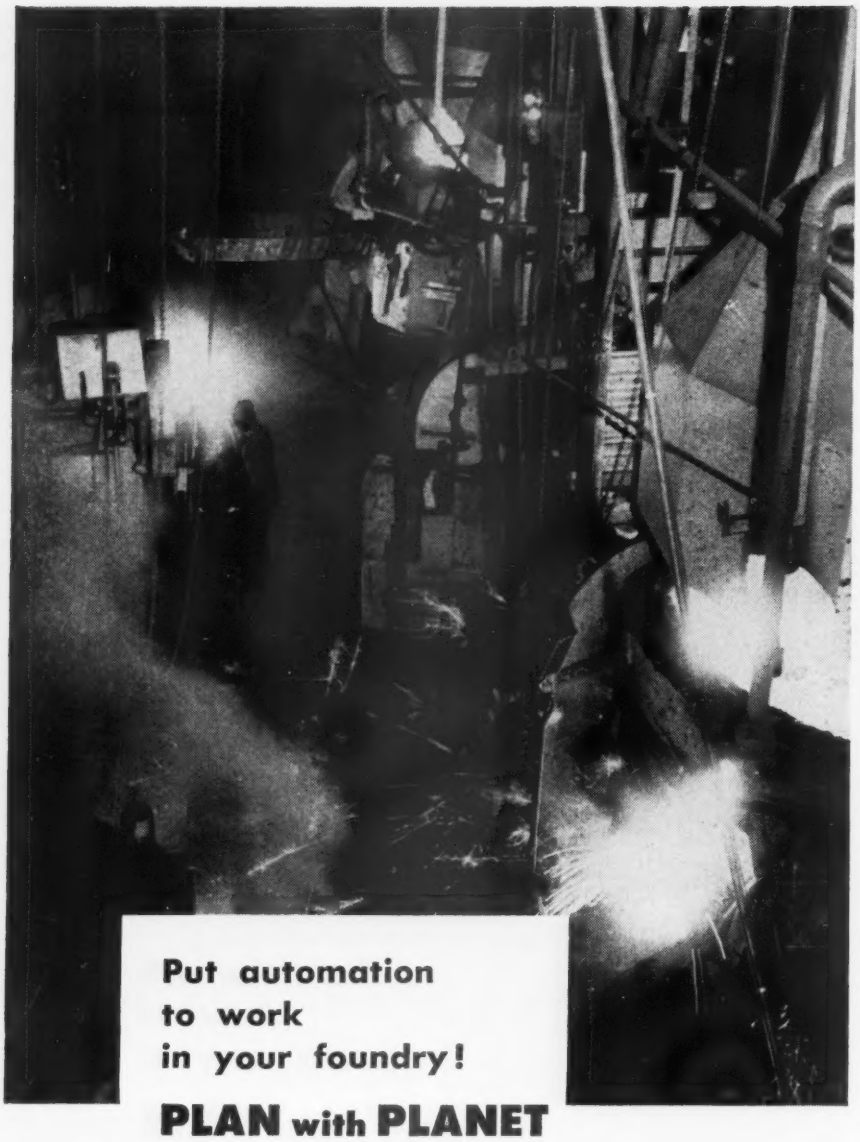

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through its employees without being garbled, in a form that will insure public acceptance, the man in charge of the program (he may be the personnel director, educational director, or public relations director) proceeds as follows:

1. The shop and office supervisors who are to lead the meetings are called together, and the administrator of the program explains the purpose of the meetings and the part superivsors are to play.

2. With these supervisors, the administrator then leads the identical conference each of the supervisors is to lead later with his own subordinates. At the close of this conference, supervisors discuss the material and the methods of presentation. Each then is furnished with a detailed conference plan for future reference, together with a schedule of meetings and the mimeographed material to be issued to workers at the meetings. (This program is applicable to plants of any size. In a large plant, this material constitutes a fair-sized mimeographing and collating job and should be scheduled accordingly.)

3. The round of employee meetings is held, with attendance limited to 30 and with a 1½-hour period. In each meeting, the information is discussed, and the supervisor leading the conference satisfies himself that it is understood thoroughly by everyone present. This step does not necessitate any sort of examination, of course.

Information Will Be Accurate

At the close of each conference, supervisors request employees to pass on this information to any interested persons, these contacts to continue for a definite period—say two weeks. Experience proves that employees thus provided with the facts will average 12 or more contacts with friends or neighbors within a period of two weeks, and all tell the same accurate story.

4. In exceptional instances, a second round of conferences on the subject may be scheduled, at which employees discuss their experiences. The second meeting also affords an opportunity to add further material to the informational program. This addition may take the form of adequate rebuttals to overcome any arguments employees have encountered.

5. The success of any program of this type depends largely upon the attitude of the supervisors toward it. Once the supervisory force is sold,

individual foremen and office supervisors have little difficulty in winning the co-operation of their subordinates. For this reason, the conduct of the preliminary conference with the supervisors is extremely important. After attendance at this conference, each supervisor should be sold on the program and should feel that he is prepared to lead a good meeting with his own subordinates. As the program continues, the quality of the supervisor's conference leading will improve steadily.

Institute Elects Officers and Directors at Annual Meeting

George G. Raymond, president, Raymond Corp., shown below, was elected president of the Material Handling Institute at its annual meeting in New York recently. Mr. Raymond succeeds R. H. Davies, Clark Equipment Corp., who becomes a director. John W. Stiles, president, Island Equipment Corp., was elected first vice president and R. L. Fairbank, sales manager, Towmotor Corp., was elected second vice president.

GEORGE G. RAYMOND

Institute membership includes manufacturers of conveyors, industrial lift trucks, monorail systems, cranes and hoists, industrial containers and pallets, strapping, wheels and casters, floor trucks, industrial batteries and accessory equipment.

Elected to the board of directors were George Greenberger, president, Sage Equipment Co.; M. W. Heinritz, vice president, Gould-National Batteries; Howard Palmer, vice president, Lewis-Shepard Products Inc.; L. C. Daniels, vice president, Allis-Chalmers Mfg. Co.; W. E. Duchene, manager, material handling sales, Heppenstall Co.; A. C. Timmons, sales manager, Lift Trucks Inc., and J. W. Wunsch, president, Silent Hoist & Crane.

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Shaped Section Master Link for industrial slings

Holds its form under loads up to 18% greater!

ACCO—long a recognized leader in the design and manufacture of slings and attachments—now comes up with the sensational new SHAPED SECTION MASTER LINK for slings. Instead of having the conventional standard round section, this new master link has a *shaped* section which withstands deformation under loads up to 18% greater!

Just as a structural I-beam can handle greater loads than a solid beam (of the same weight), so does ACCO's Shaped Section Master Link give better performance under greater loads than does a link with a round section.

Better Quality—Costs No More

The new Shaped Section Master Link is a *better quality* link. It has a smoother surface. It provides greater safety for men, machines and materials. It costs us more to make—yet there is *no increase in cost to you!*

Made of Accoloy, the Shaped Section Master Link is made in all sizes from ½" through 1¾". It is available as a component of American Chain slings—also separately, for use with any make of chain or wire rope sling. *Ask your sling distributor*, or write our nearest District Office for full information.

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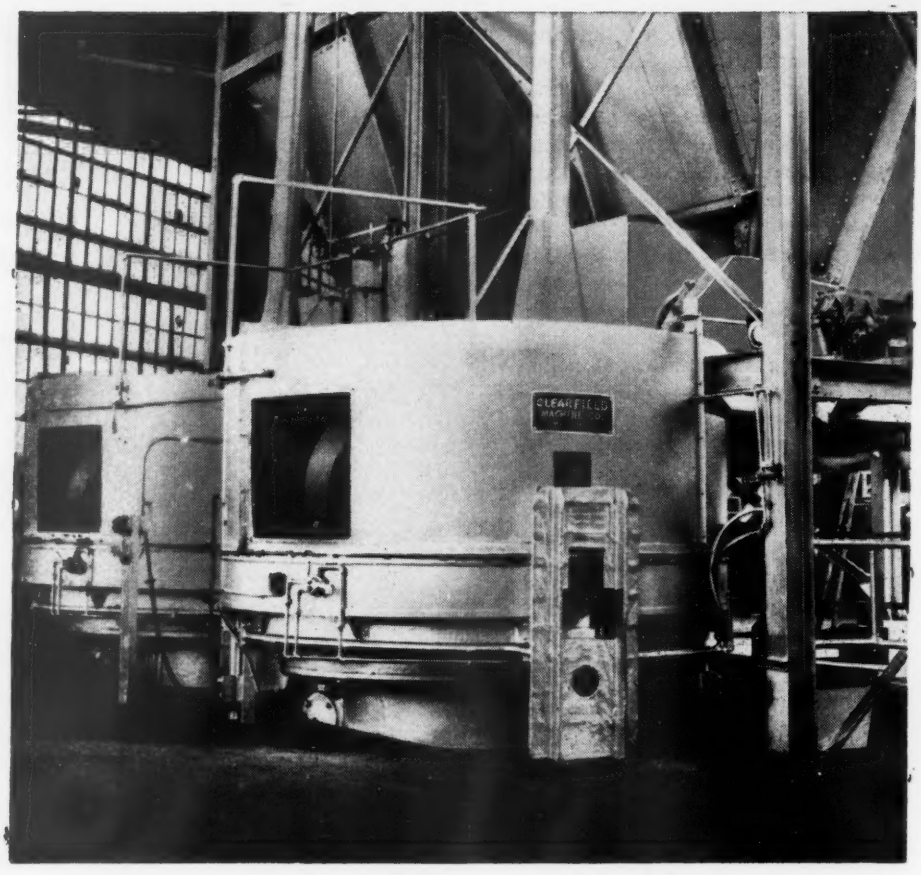

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SCOPE

1. These specifications cover gray iron castings use in the automotive and allied industries.

HARDNESS

2. (a) Castings shall conform to the requirements as to hardness prescribed in Table I. By agreement between the manufacturer and the purchaser, hardness may be specified at definite locations on the castings.

(b) Hardness tests shall be made near the fracture on the broken halves of the test bars suitably ground for the test. Test bars shall receive the same thermal treatment as the castings.

TABLE I—Physical Requirements of Automotive Gray Iron Castings[a]

Alloy No.[b]	Brinell Hardness Number	Transverse Strength Min. Lb	Deflection Min. in.	Tensile Strength Min. psi
110	187 max.	1800	0.15	20,000
111	170 to 223	2200	0.20	30,000
120	187 to 241	2400	0.24	35,000
121	202 to 255	2600	0.27	40,000
122	217 to 269	2800	0.30	45,000

[a] Properties determined on test bar 1.2-in. in diameter, broken on 18-in. supports.
[b] These numbers are identical with corresponding SAE numbers in the Standard for Automotive Gray Iron Castings of the Society of Automotive Engineers.

TRANSVERSE STRENGTH

3. (a) The transverse test shall be made as described in the standard specifications for Gray Iron Castings (ASTM Designation: A48)

(b) Values shall conform to the requirements prescribed in Table I. In case the size of the bar is not specified, the 1-Z-in. diameter bar shall be used.

PHYSICAL PROPERTIES AND CHEMICAL COMPOSITION

4. (a) Castings, except those intended for brake drums and clutch plates shall conform to the requirements as to tensile strength prescribed in Table I.

(b) Brake drums and clutch plates are considered as special cases under these specifications. Materials intended for such services shall conform to the requirements listed in Table II.

(c) Tension test specimens shall be machined from test bars and tested in accordance with the ASTM Specifications A 48. Tension test specimens shall be machined from the transverse test bars to the dimensions shown in ASTM Specifications A 48. By agreement between the manufacturer and the purchaser, tension test specimens may be taken at specified locations. In such instances the physical properties as represented by test bars should be in agreement with the specifications as supplied by the purchaser. The minimum values shall be established by joint agreement. Tension tests which are made on specimens taken from castings may not agree with tests on specimens taken from test bars.

TABLE II—Chemical, Physical, and Structural Requirements of Automotive Gray Iron Castings for Brake Drums and Clutch Plates[a]

	Alloy No. 113[b, c]	Alloy No. 114[b, d]
Chemical Composition		
Total Carbon, per cent	3.40 min.	3.40 min. (mandatory)
Typical Compositional Ranges		
Silicon, per cent	1.10 to 1.70	1.10 to 1.70
Manganese, per cent	0.60 to 0.90	0.60 to 0.90
Sulphur, max. per cent	0.14	0.14
Phosphorus, max. per cent	0.20	0.20
Alloys	As required	As required
Physical Properties		
Brinell Hardness Number	179 to 229	207 to 269
Transverse Strength, min. lb	2200	2600
Deflection, min. in.	0.20	0.27
Tensile Strength, min. psi	30,000	40,000
Structural Properties		
Graphite[e]	Type A, Sizes 2 to 4	Type A, sizes 3 to 5
Matrix	Lamellar pearlite with ferrite if present not to exceed approximately 15 per cent	Fine lamellar pearlite with excess constituent, free cementite or free ferrite or both not to exceed approximately 3 per cent

[a] Properties determined on test bar 1.2-in. in diameter, broken on 18-in. supports.
[b] These numbers are identical with corresponding SAE numbers in the Standard for Automotive Gray Iron Castings of the Society of Automotive Engineers.
[c] Brake drums and clutch plates for moderate service requirements where high-carbon iron is desired and heat checking is a problem.
[d] Heavy duty drums and clutch plates where both heat checking and strength are definite requirements. Since the same base iron is indicated for both No. 113 and 114 it is presumed that alloys will be used especially in the latter to meet the strength and structural requirements.
[e] The type and size of graphite referred to in this table is in accordance with the Recommended Practice for Evaluating the Microstructure of Graphite in Gray Iron (ASTM Designation A 247).

SPECIFICATIONS FOR AUTOMOTIVE GRAY IRON CASTINGS

ASTM Designation: A 159—55

WORKMANSHIP AND FINISH

5. Castings shall represent good foundry practice, shall be smooth and clean, and shall be free from injurious flaws and defects. In other respects the castings shall conform to special requirements agreed upon by the manufacturer and the purchaser.

MACHINABILITY

6. Castings shall machine satisfactorily.

INSPECTION

7. The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the material ordered. The manufacturer shall afford the inspector, without charge, all reasonable facilities to satisfy him that the material is being furnished in accordance with these specifications.

TABLE III—Typical Base Compositions of Automotive Gray Iron Castings[a]

Alloy No.[b]	Total Carbon Per Cent	Silicon Per Cent	Manganese Per Cent	Sulphur Per Cent	Phosphorus Per Cent
110	{ 3.40	2.80	0.50 to 0.80	0.15	0.25
	{ 3.70	2.30	0.50 to 0.80		
111	{ 3.25	2.30	0.60 to 0.90	0.15	0.20
	{ 3.50	2.00	0.60 to 0.90		
120	{ 3.20	2.20	0.60 to 0.90	0.15	0.15
	{ 3.40	1.90	0.60 to 0.90		
121	{ 3.10	2.10	0.60 to 0.90	0.15	0.12
	{ 3.30	1.80	0.60 to 0.90		
122	{ 3.00	2.10	0.70 to 1.00	0.15	0.10
	{ 3.20	1.80	0.70 to 1.00		

[a] These suggestions are offered so that the manufacturer will guard against either a low value or a high value for both carbon and silicon. If either one is on the high side, the other should be low.

[b] These numbers are identical with corresponding SAE numbers in the Standard for Automotive Gray Iron Castings of the Society of Automotive Engineers.

REJECTION

8. All castings which fail to conform to any of the provisions of these specifications shall be subject to rejection. Castings which show injurious defects subsequent to their acceptance at the manufacturer's works will be rejected and the manufacturer shall be notified promptly.

APPENDIX

A1. The data in this appendix are furnished as information only and do not constitute a part of these specifications.

A2. Chemical Composition—The typical base compositions shown in Table III are furnished as information only and are not to be construed as required or sufficient. In some cases, it may be desirable to use alloying elements to obtain the specific service requirements demanded. The kind and amount of alloying constituents used should be a matter of agreement between the manufacturer and the purchaser.

A3. Alloying Elements—When alloying elements are specified. Table IV shows the practical range for commercial limits.

A4. Suggested Uses—Suggested uses for the several automotive gray iron castings prescribed in these specifications may be classified as follows:

No. 110—Miscellaneous soft iron castings in which strength is not of primary consideration. (Either as cast or annealed.)

TABLE IV—Residual and Alloy Ranges[a]

Elements	Permissible Residuals in Base Iron, Per Cent	Recommended Ranges (For Specification Purposes) from Mean Specified Alloy Content, plus or minus per cent
Nickel	0 to 0.20	0.15
Molybdenum	0 to 0.08	0.075
Chromium	0 to 0.10	0.10
Copper	0 to 0.20	0.10
Vanadium	0 to 0.03	0.03

[a] By agreement between the manufacturer and the purchaser, closer or wider limits than shown in this table may be acceptable.

Table IV

No. 111—Small cylinder blocks, cylinder heads, air-cooled cylinders, pistons, clutch plates, oil pump bodies, transmission cases, gear boxes, clutch housings, lightweight brake drums, etc.

No. 120—Automobile cylinder blocks, cylinder heads, flywheels, cylinder liners, pistons, etc.

No. 121—Truck and tractor cylinder blocks and heads, heavy flywheels, tractor transmission cases, differential carrier castings, heavy gear boxes.

No. 122—Diesel engine castings, liners, cylinders, pistons, and heavy parts in general.

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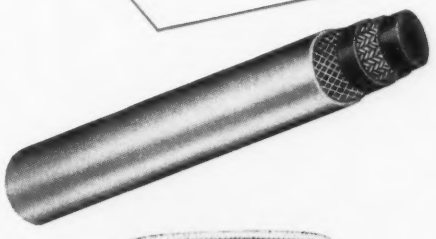

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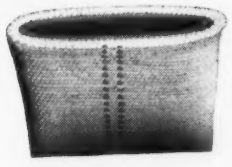

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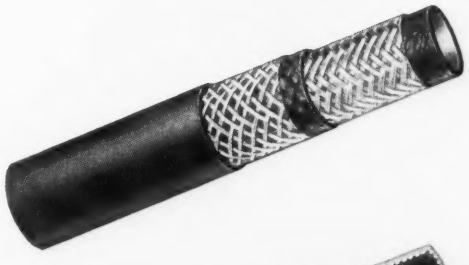

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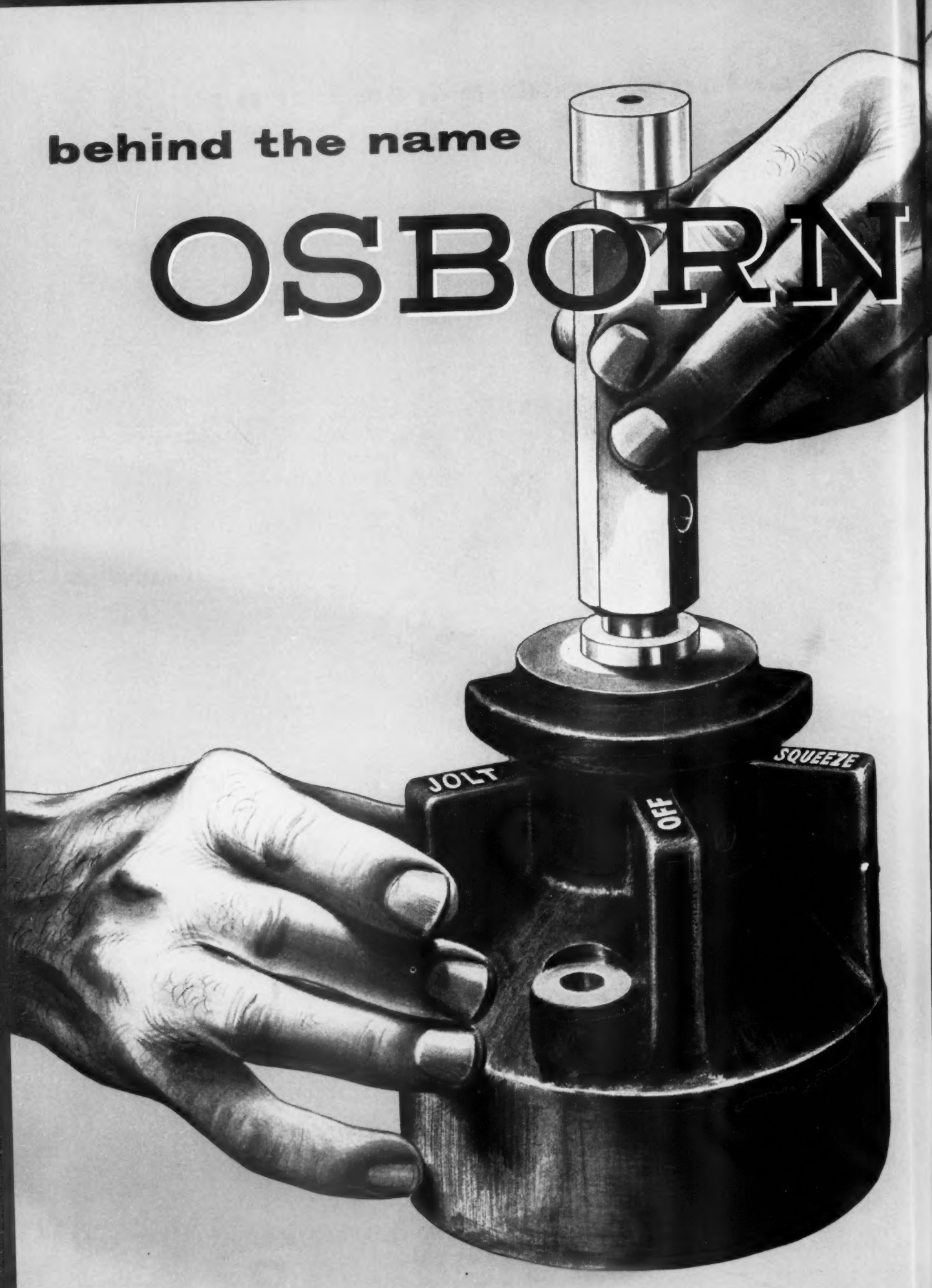

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Preventive Maintenance Helps Control of Costs

Maintenance Should Avoid Occurrence of Downtime

By William G. Conner Jr.

MAINTENANCE of manufacturing facilities is an important aspect of the production of goods. The accelerated rate of automation in our factories and foundries is bound to affect any maintenance program, but should not necessarily increase costs. If the cost of manufacturing is to be controlled and lowered and the product is to flow uninterruptedly through our factories to the customer and result in a fair profit, more and more thought must be given to maintenance. The subject requires almost constant attention.

The foundry industry, foundry equipment manufacturers, foundry consultants and foundry engineers have kept abreast of the times and led the field in the development of new equipment and techniques. Alert to meet competition, they have given every consideration to minimizing maintenance. Maintenance is of major importance in every manufacturing establishment, including foundries. Every employee must be made to realize the importance of diligent care and economy in the use and operation of his company's equipment and property.

Assumption of responsibility relative to maintaining a foundry, a department or an entire factory; keeping it going at full capacity; and producing at minimum costs is not limited to a maintenance department. If manufacturing operations are to be kept at peak efficiency, every single individual in an organization, from the plant manager to the man on the job, must be maintenance conscious and assume a part of the task.

Producing at a profit and meeting competition is the constant drive and aim of every foundry. With rising labor and material costs, additional equipment and more automation are needed to maintain or further reduce the cost of consumer goods. Because such new installations create the possibility of increased maintenance costs per unit of product, the necessity for an over-all reduction of maintenance expense becomes more acute. But it can be accomplished.

Maintenance charges are of much concern and do affect product costs, but these direct costs are only part of the total. Breakdowns, causing lost time and loss of production, can

be an extremely expensive item, although not charged to maintenance. Such interruptions may cause either a few or many employees to lose time while they await a repair. Production also is stopped, and long delays result in the loss of business and customers. Breakdowns should be studied and every effort made to avoid them.

Today's average over-all rate of operation is probably at the highest point thus far in the history of industry. To sustain this pace, more machinery, more equipment and more automation has been utilized, necessitating good, well planned, thorough maintenance. The old, slipshod methods of "tying it up with baling wire" can no longer be tolerated. Maintenance dollars must be spent wisely. The entire maintenance program of any individual machine, unit, foundry or entire plant must be studied and reviewed frequently with a view to reducing maintenance costs.

Absolutely no maintenance operation or requirement can be taken for granted; each job must be defined and supervised to a successful conclusion. This approach alone should result in lower costs by avoiding unnecessary or repetitious work and insuring that work to be done is fully understand. A story making the rounds several years ago seems to illustrate this point: A railroad division superintendent was presenting an employee with a service pin and watch in recognition of 25 years of faithful service. The employee's job for many years had been to check the oil in journal boxes and to inspect that general area for possible trouble on incoming trains at a division terminal. After the presentation, the superintendent asked the employee what was the biggest defect he had discovered, thus avoiding an accident. The employee said he did not know he was looking for trouble or defects; all he was told to do was to hit the side of the journal box, open it, close it, and go on to the next one.

The installation of new equipment and full knowledge of the proper operation can assist materially in keeping maintenance costs at a minimum. It too often is assumed that the operation of equipment is fully understood. Manufacturers and engineers have built into the equipment all the necessary technical features to make it function as represented. Complete knowledge of the equipment and its use at the time of installation is necessary to avoid costly maintenance. A thorough check of the assembled unit or installation should

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be made, for errors can creep in under even ideal conditions.

A well trained, minimum force, properly supervised, with work scheduled in advance at all times, causes a reduction of costs. The "Jack of all trades" has disappeared just about completely from the scene. Today, employees and employers are faced with various craft and trade jurisdictions. The trend toward job descriptions and specialization stresses the necessity of having a well trained, adequately supervised maintenance force. Using the proper approach to this phase of the problem, along with determination, can result in lower over-all costs.

Proper Maintenance Cuts Costs

Preventive maintenance will produce the most abundant cost reduction, not only in actual maintenance costs, but also by reducing and minimizing breakdown expense and consequent lost time.Although there may be no universal, set formula to follow, preventive maintenance is not a mystery and requires only the use of good common sense to bring about economy. Compare the operation of a factory and that of the human body. Consider for a moment going to the dentist twice a year, a yearly physical check, consulting with the family doctor, having your children vaccinated—all of these are preventive measures.

Although the human body has the ability to make some of its own minor repairs, such is not the case with machinery, equipment and buildings. Anticipating possible trouble by making necessary inspection and repairs is a large part of preventive maintenance. This practice undoubtedly will reduce the over-all cost of maintenance and the product.

The best short description of preventive maintenance can be found in the dictionary. Prevent is defined. "To stop or hinder from happening by means of a previous measure." Preventive is defined, "Intended or serving to prevent or ward off any kind of harm." Preventive maintenance hinders breakdowns from happening and wards off harm to production, thus saving time and money. A statement made by Benjamin Franklin many years ago, "Remember that time is money," is no less appropriate today.

On numerous occasions, preventive maintenance is set up in a program or schedule considered routine and forgotten, but to obtain the full value of reduced expense resulting from preventive maintenance, the subject or program requires constant study and supervision, making necessary

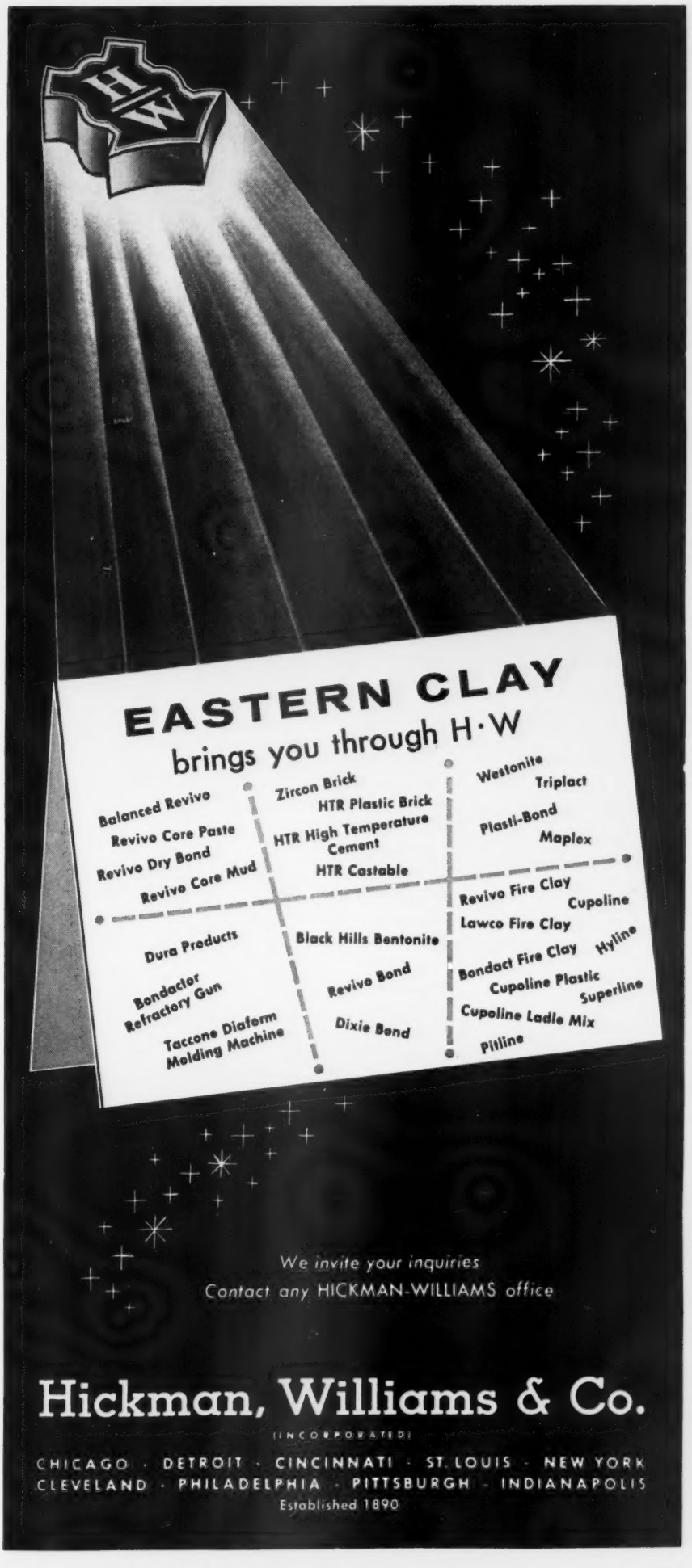
regular alterations and improvements.

Too much can be extremely costly and may defeat the whole purpose of preventive maintenance and actually increase costs. This is a definite indication of the almost endless task, far from routine, necessary for a satisfactory program. What may be low-cost approach today could cost excessively tomorrow. Most foundries are continually improving their products, developing and using new and better materials, and improving methods almost daily. All such improvements must be worked into the maintenance program immediately to obtain further reduction of maintenance costs.

The greatest asset to full use of preventive maintenance is proper, comprehensive and timely inspection of every detail under the authority of the maintenance department. The frequency of such inspections can be determined only by experience, keeping in mind the constant changing of conditions and materials. For the best results in lower costs, these inspections should be made by a well qualified person or persons from the maintenance group, the supervisory force or both. To insure alertness and competent investigation, an occasional inspection by an unrelated but capable person would be of assistance.

Many major and some minor maintenance requirements can be set up on a definite schedule. These schedules must be checked periodically in order to be positive the requirements have not changed and that improved techniques and materials are being used. Such schedules should include definite planning for performing maintenance work during lunch-hour, off shift, week-end and vacation periods. This method will keep production rolling and hold maintenance as well as breakdown-time costs at a minimum.

"You're leaving 'em in too long!"



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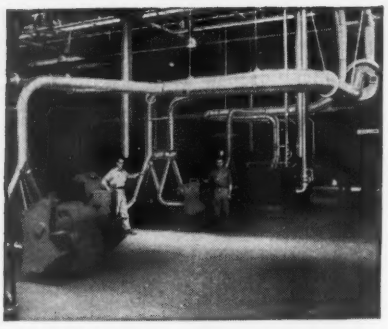

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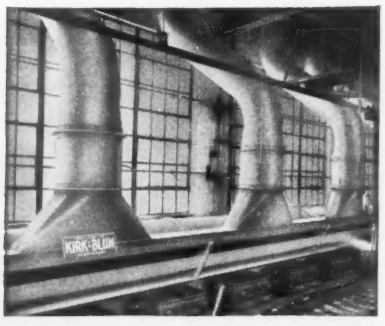

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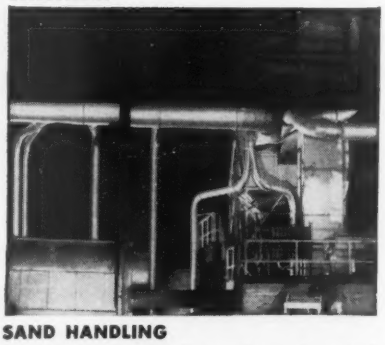

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Good Prospects Seen for Heating Equipment Sales

IHEA Members Optimistic At Their Annual Meeting

BUSINESS prospects for industrial heating equipment manufacturers continue good. Orders this year are expected to be only moderately below the 1955 volume, which was the third highest in history.

This outlook was indicated by members of the Industrial Heating Equipment Association at their annual meeting in Chicago, Jan. 23-24. Bookings of furnace builders last year totaled slightly under $100 million, nearly 116 per cent ahead of 1954. Only the war years of 1942 and 1951 showed larger volumes.

ELTON E. STAPLES

Elton E. Staples, executive vice president, Hevi Duty Electric Co., Milwaukee, was elected president of the association. He succeeds Horace Drever, president, Drever Co., Philadelphia. Mr. Staples was graduated from Massachusetts Institute of Technology in 1926 with a degree in metallurgical engineering. He was with the Dorr Co. in the basic production of metals for five years, and spent eight years in industrial engineering sales for the Gulf Oil Corp. Since 1940, Mr. Staples has been with the Hevi Duty Electric Co., serving as district manager in Chicago and Cleveland, later as vice president in charge of sales and now executive vice president of the organization.

New vice president of IHEA is Walter H. Holcroft, executive vice president, Holcroft & Co., Detroit. R. E. Whittaker, Swindell-Dressler Corp., Pittsburgh, was re-elected treasurer, and Carl L. Ipsen con-

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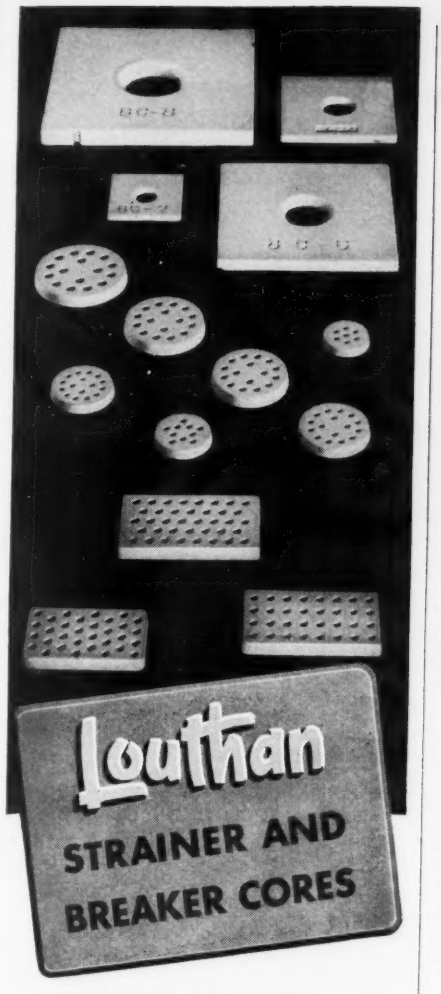

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tinues as executive vice president at Washington headquarters. Newly elected directors are Mr. Whittaker, Leon B. Rosseau, Ajax Electric Co., and J. H. Sands, Eclipse Fuel Engineering Co.

Committee meetings and discussions of industry problems occupied most of the association's two-day program. A banquet Monday evening featured entertainment by the Lindberg Chorus of the Lindberg Engineering Co., Chicago, and a talk by Kenneth W. Haagensen, director of public relations, Allis-Chalmers Mfg. Co., Milwaukee.

Viewpoint of the heating equipment user was expressed in a talk by John Graham, chief metallurgist, International Harvester Co., Chicago. Make sure that equipment works right when it is installed, he said, because it must stand as the supplier's representative for years to come. Among his other recommendations were these:

Safety should be built in the equipment and it must meet insurance standards. When figuring on a new installation, keep not only the plant engineer but also the plant metallurgist and the purchasing department informed. Provide ample advice on setting up a preventive maintenance program, and have spare parts on hand for quick delivery.

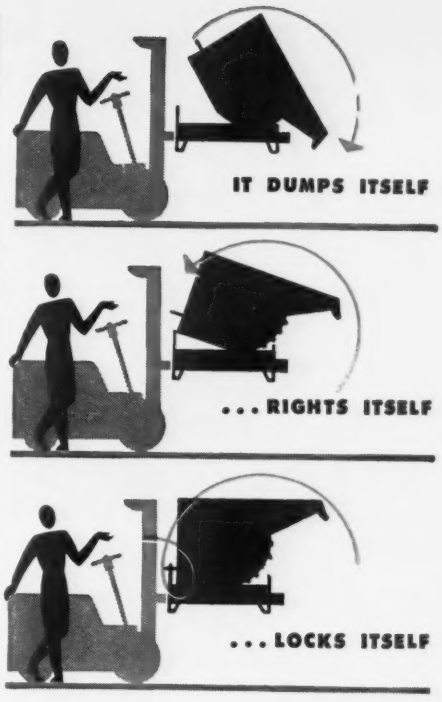
Book Review

ASTM Standards, 1955, Part I *Ferrous Metals*, cloth, 1802 pages, 6 x 9 in., published by American Society for Testing Materials, 1916 Race St., Philadelphia 3.

This 1955 edition of *ASTM Standards* replaces the former edition and its two supplements dealing with ferrous metals. It contains more than 300 standards, tentative specifications, methods of test and definitions adopted formally by the society. Fifty-two of these relate to castings.

Fifteen standards and tentative specifications as well as three methods of test and one on definitions pertain to steel castings. For cast iron there are 11 standards and tentative specifications, 4 methods of test, 2 recommended practices and 2 definitions. Four specifications relate to malleable iron and 10 are devoted to ferroalloys.

Other materials covered include steel piping, steel flat products, steel bars, bolts and rivets, steel billets, forgings and axles, steel rails and accessories, rolled railroad wheels and tires, spring steel, chain, bearing steel, welding electrodes and rods, wrought iron, metal powders and metal powder products, and metallic coated steel products.



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Fillet Wax Useful in

FASTENING PATTERN LETTERS

By H. F. DIETRICH
Head, Foundry Department
Kansas State College, Manhattan, Kans.

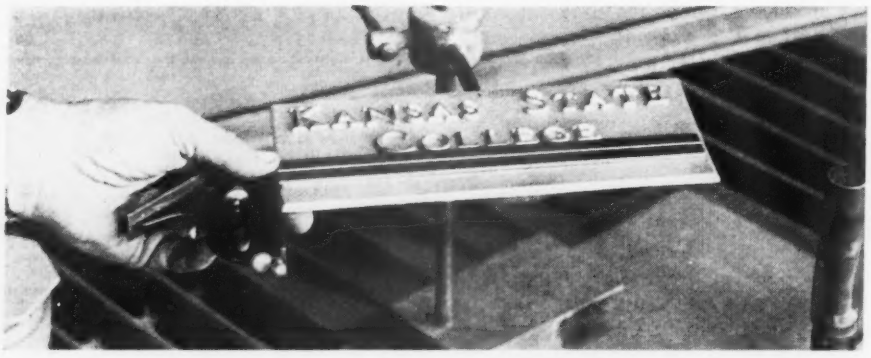


Fig. 1—Loose letters are placed on the background plate and aligned

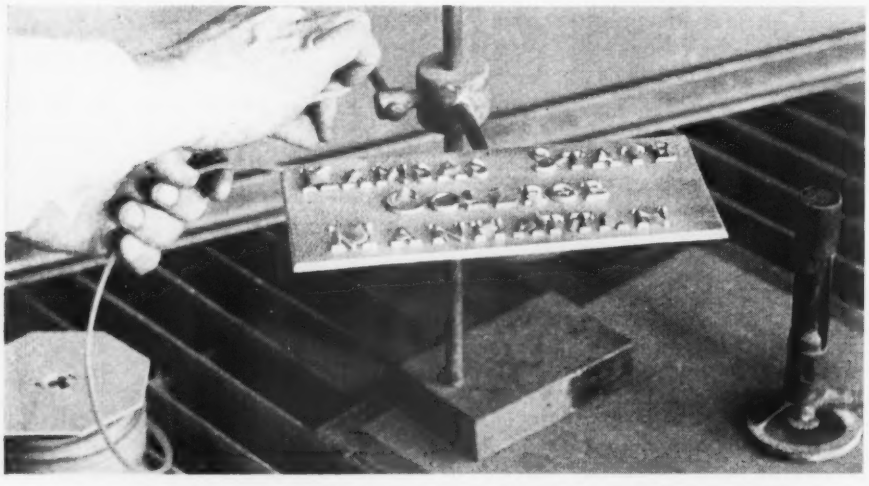


Fig. 2—Small pieces of fillet wax are dropped carefully on letters

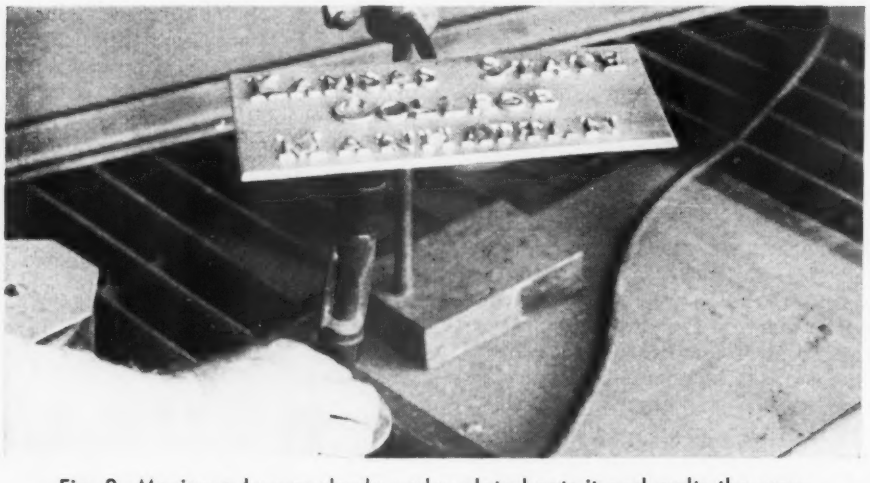


Fig. 3—Moving a burner slowly under plate heats it and melts the wax

Fig. 4—Melted wax creeps under and around letters and forms fillets

PATTERN letters that have been fastened to the background plate with shellac or lacquer are difficult to remove. It is even more difficult to clean the background plate and letters for re-use. The accompanying illustrations demonstrate a fast, easy method of composing a name plate.

The background plate is made of cast aluminum and placed on a ring stand. Standard pattern letters without prongs are placed in position and aligned with a combination square. Small pieces of fillet wax are dropped on the loose letters with care to avoid shifting.

When all of the letters have had wax dropped on them, the plate is heated on the lower surface with a Meeker burner. The heat, traveling through the plate, will melt the wax. Because wax has a tendency to creep and form a concave meniscus, the wax will flow under the letter and up the sides to form a small, smooth fillet all around the letter. Wax dropped on one edge, or in the center of open letters such as O, R and D, will flow, by capillary action, under the letter to the other side, holding it in position when cool.

A small piece of wax can be dropped on any letter that is not completely surrounded by a smooth, shiny film of wax. If this is done while the plate is hot, the additional wax will blend with wax under the letters.

When the casting has been made and inspected, the background plate is cleaned by heating from the under side to melt the wax. The letters are pushed off into a container of naphtha or white gasoline, and the plate cleaned of all wax by wiping with a dry clean cloth while the plate is still hot.

Submersion in naphtha for a day or two will dissolve the wax from the letters, and they can be sorted and returned to the fonts. Because the letters are made of a lead alloy, submersion in carbon tetrachloride will leave a dull gray film of lead chloride on the letters. This can be avoided by the use of naphtha or gasoline to clean them.

FOUR SIZES

H1 — Bench Model

H5, H12, H25 — Floor Models

HANSBERG SHOOTERS operate on a new patented principle which produces a **SHOOT** rather than a blow. This feature distinguishes them from conventional blowers because the sand is ejected suddenly out of the chamber in a compact mass without erosion of the core boxes or patterns.

VENTING is reduced to a minimum because the propelling air does not mix with the sand. Only the initial air in the cavity must be expelled. This air usually can be released through vent holes in the **SHOOT HEAD.**

HIGH DENSITY cores and molds are made as the result of the impact caused by the shooting action.

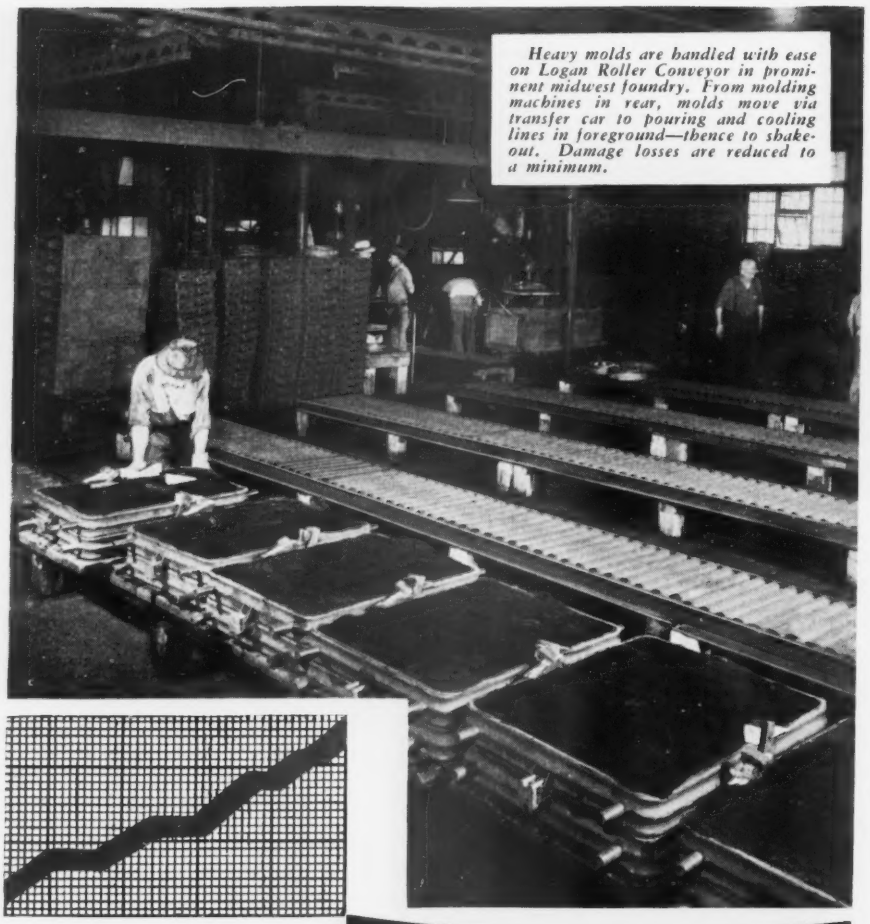
HIGH GREEN STRENGTH sands can be used because the exhaust of the trapped air explodes back through the sand to aerate it for the next operation.

WOODEN CORE BOXES can be run on these machines without having the finish marred.

HANSBERG SHOOTERS are ideal for making **SHELL** cores and molds and are the only machines which successfully handle the sand mixtures for the CO_2 **PROCESS.**

These machines are ruggedly constructed with simple mechanism to insure low maintenance.

Consult "Davenport" for the solution to your core and mold making problems.



Heavy molds are handled with ease on Logan Roller Conveyor in prominent midwest foundry. From molding machines in rear, molds move via transfer car to pouring and cooling lines in foreground—thence to shakeout. Damage losses are reduced to a minimum.

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Dock Operation Records Can End Inefficiency

Materials Handling Expert Suggests Cost Technique

BUSINESSMEN who don't keep cost records of their receiving and shipping dock operations may be losing money through costly, hidden waste. Maintenance of such records is simple, costs little and may cut expenses by showing up poor utilization of labor, misuse of handling equipment or similar soft spots.

A technique for cost recording has been recommended by Neil Drake, partner in the physical distribution firm of Drake, Startzman, Sheahan and Barclay, New York, which recently completed a seven-month, eight-city survey of dock procedures.

Mr. Drake suggests that to determine the productivity of a dock operation, the total man-hours expended in a given period should be divided into the total tonnage handled across the docks in that time. For example, if four men work an eight-hour day and handle 64,000 lb of freight, both receipts and shipments, productivity is 2000 lb per man-hour.

When man-hours are calculated, all personnel connected with dock activities should be included, not just freight handlers. Other persons may be responsible for such jobs as checking, operating handling equipment, spotting, cleaning and supervising.

In addition to direct labor costs, the operating cost of mechanical equipment should be included to give the report complete accuracy. Stand-

"Your hand is flawless, Higgins. From now on let's X-ray the castings!"

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This new "Serv-Rite" thermocouple head is actually small enough to be held comfortably in the palm of your hand. But size is only one of the many features that make this thermocouple head really extraordinary. It is loaded with installation and service conveniences that any user of thermocouples will appreciate at once.

The body is of malleable iron, cadmium plated for durability. A new type friction lock assures easy removal or tightening of the cap — a quarter turn does it. An asbestos gasket makes the head dirt- and moisture-proof. With a choice of ½", ¾", or 1" IPS opening for the protecting tube, you can standardize on one style head.

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ard cost accounting methods can be applied to arrive at a fair hourly charge for equipment. Such items as pallets should not be ignored.

If the dock works more than one shift, reports should be made for each. Accurate records are necessary for total daily production and for total daily labor and equipment costs. With these figures, a handling cost per hundredweight can be computed by adding personnel and equipment costs and dividing by the hundredweight handled.

Once records are available over a reasonable period, productivity standards can be set. After that, the records should be watched for a decline in productivity or a rise in costs. If these appear, investigation may determine that too many freight handlers are being used during lull periods, for example, or that unnecessary part-time hours are being spent on the dock. If equipment costs rise, the increase may indicate that too much equipment is allocated.

Misco Building Third Plant For Investment Casting

Misco Precision Casting Co., Whitehall, Mich., is building a new plant in Muskegon, Mich., for the production of investment castings. Theodore Operhall, Misco president, said that the growing need for investment castings in the aircraft industry prompted the expansion of capacity.

Misco operations in Whitehall and

DONALD HARPOLD — THEODORE OPERHALL

Detroit, totaling 75,000 sq ft of plant space, currently employ 825 persons. The Muskegon plant will contain 85,000 sq ft of office and manufacturing space and eventually will employ 1200 people. Donald Harpold will be plant manager and Ajax Vartanian plant superintendent.

The company has specialized in blade and vane turbine elements for gas turbine applications. This latest capacity expansion will make Misco the world's second largest producer of investment castings, according to the company.

Low cost ¾ inch lining of CARO-LINE handles 120 ladles of iron

All-day operation at high temperatures has proved that *IRONTON* CARO-LINE can deliver superior service in any malleable iron or electric steel ladle. One Ohio malleable foundry pouring iron at 2860° F. fills its 250 lb. ladle 120 times before relining. The economy key is in the thickness of the lining—only ¾ of an inch! If you melt

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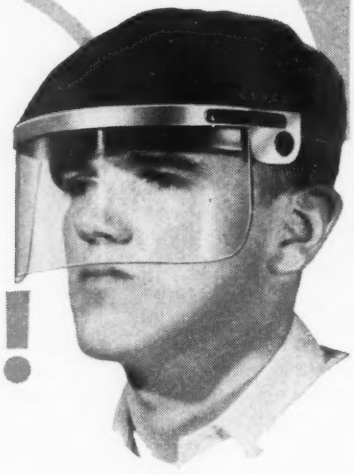

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for general shop work

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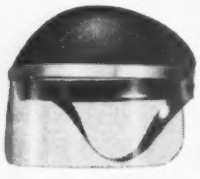
The head band of vinyl plastic is adjusted by a sliding strap. There is no metal or mechanical adjustment to snag the hair. The shield conforms easily to the head at all points. Windows are of cellulose-acetate and may be in either green or clear.



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Book Review

Steel Foundry Practice, by John Howe Hall, cloth, 6 x 9 in., 496 pages, published by Penton Publishing Co., Penton Bldg., Cleveland 13. Price, $12.

This book, the latest Penton Publishing Co. volume on foundry practices, brings together in one collection the late John Howe Hall's FOUNDRY articles on steel foundry practice. They were written by Mr. Hall as a comprehensive, detailed discussion of such practices which would comprise an integrated book upon their completion. The last chapter was finished just before his death in 1953.

The contents include chapters on core and molding sands; patterns and molding methods; gates and heads; machine molding; flasks and rigging; centrifugal casting; shakeout, cleaning and welding; heat treatment; cast-weld construction; open-hearth steelmaking; electric melting furnaces; the converter process; and pouring practice. More than 250 illustrations supplement the text.

To these subjects, Mr. Hall brought a wealth of knowledge and experience. He was associated with the production of steel castings for nearly 50 years. During that period he became one of the leading authorities in the field. Mr. Hall received his bachelor's and master's degrees from Harvard University and spent an additional year there doing research work under Professor Albert Sauveur. He was employed by Bethlehem Steel Co. and Buffalo Crucible Castings Co. until 1906, when he joined Taylor-Wharton Iron & Steel Co. He remained there until 1937, when he became a consulting metallurgist.

In addition to his development work, especially in the field of heat-treated manganese steels, he contributed much to the technical literature on steel castings. His previous major work was *The Steel Foundry,* published in 1914, with a second edition in 1922.

Mr. Hall was the author of many papers presented before the American Society for Testing Materials, the American Foundrymen's Society, the American Institute of Mining and Metallurgical Engineers and the American Society of Mechanical Engineers. In 1924, he received the first Whiting Medal awarded by the AFS, and he presented the Henry M. Howe Memorial Lecture of the American Institute of Mining and Metallurgical Engineers in 1929. Henry M. Howe, with whom Mr. Hall worked, was his uncle.

His background, education, experience and editorial ability made John Howe Hall especially well fitted to prepare this valuable book on the operation of a basic industry.

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How To Avoid Hazards In Material Handling

Proper Handling Methods Cut Injuries and Losses

By Ernest W. Fair

LOWER production costs, reduced accidents and more profits — all three result from reduction of hazards in the handling of materials in the foundry. The enforcement of some simple methods makes it easy to reduce the cost of handling castings and other work, cuts down on damaged materials and finished work and materially affects safety.

Many studies have shown that a sizable proportion of the accidents occurring in the handling of heavy castings and materials have arisen because employees lack knowledge of proper procedures. Making certain that the employee is aware of his personal stake in safety also is important.

A number of steps can be taken with very little cost. They require recognition of hazards, remedying physical situations which encourage them, and educating workers to follow safe procedures. Such procedures are a responsibility not only of the safety enforcement department of the foundry, but of supervisors and foremen as well. The following paragraphs discuss some of the more important precautions.

Set up traffic lanes not only in raw materials warehousing areas, but all through the foundry where trucks—either hand or power—are to move. These lanes should be clearly marked. There also should be a rule requiring that employees keep within these lanes when using any trucks.

Most accidents from overhead movement result from carelessness or lack of attention to detail. All workers concerned with the transmission from the time a casting, for example, is picked up until it is set down should never forget safe practices for a single second. They must be certain that loads are secure before being hoisted, that the crane operator is vigilant for any possible obstruction or unlooked for worker in the way during movement, and that no one is beneath particularly heavy jobs while they are being either lifted or lowered.

Clear all aisles of any overhanging or projecting obstructions. In many instances such overhangs present no hazard, but when an unusually tall load is being carried or two trucks are passing with big loads, they suddenly can create a tremendous

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Is there anything to beat your favorite ladle lining? IRONTON BERLITE will save you money and we will prove it to you in your own foundry. It won't cost you a cent to try this multi-purpose, super quality refractory. We will ship you enough for a fair test if you agree to pay the freight. Follow suggestions in our technical bulletin and let BERLITE prove itself.

EASY PEELING is only one big advantage for users of IRONTON BERLITE. You save linings because the easy removal of slag and metal doesn't destroy the linings. We list seven uses for this super-quality product.

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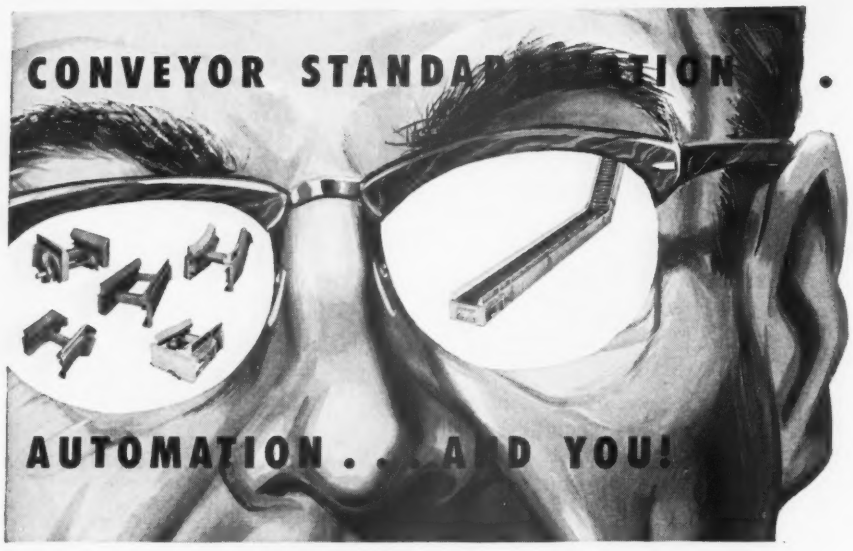

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hazard. Wherever such projections can be removed at reasonable cost, it is a good investment to do so.

Watch out for heat. Be certain that castings are cool before they are handled, and then do so only with proper gloves. "That's cool enough to move barehanded" is a statement that has fooled many a worker.

Lighting should be perfect on all aisles, from overhead fixtures with globes big enough to light up every possible foot of the movement area. This point also calls for constant maintenance of such lighting. Don't let a single burned-out bulb remain in a fixture even for 10 minutes. It takes but a fraction of a minute for an accident to occur in a darkened area. Bad lighting contributes to many materials handling accidents, particularly in aisles.

Blind corners should be avoided wherever possible. When stacking conditions make it impossible to eliminate them, large mirrors should be placed at such corners so that an employee moving in one aisle has a clear view of the aisle intersecting his own.

Speed Causes Plant Accidents

Avoid speed, especially in power trucks. Speed kills on the highway, and speed causes accidents and damage in the foundry and storeroom as well. Employees using such trucks should be only those who are extremely safety conscious. They should be impressed with the wisdom of reducing their speed to the bare minimum in any hazardous spot, such as in open aisles or around corners.

Keep floors in top condition, particularly those used as runways in materials handling. On wood, this measure means attention to loose boards which can overturn a heavily loaded truck. On concrete floors, it means filling holes which can damage materials or the truck and cause injury to the employee using it. On earthen floorways, it calls for attention to holes, ridges, possible wet areas or any other condition which may affect smooth movement, either afoot or in a lift truck.

Pad handles on all two-wheel trucks and provide knuckle guards on the handles. This step eliminates hand injuries which can occur under unusual circumstances. It also avoids spills which may occur in an emergency when an employee releases his hold to protect his fingers because no guards are provided.

Be tough about truck maintenance. Defective trucks create a tremendous accident hazard and invite damage to loads. The few cents saved by neglecting a minor repair may result in the loss of many dollars because of damaged materials. Usually defec-

tive trucks are kept in use by employees who feel the trouble is not sufficient to warrant turning it over to maintenance for repair. If they know management wants each truck repaired as quickly as damage is discovered, such hazards will present less danger.

Only trained operators should be allowed to use such materials handling trucks, particularly the power type. The idea that such units are so simple to use that anyone can handle them is mistaken. Their proper use requires a thorough knowledge of how they are to be loaded, moved and handled.

Avoid overloads, for no matter what the emergency, it never justifies the hazard an overload creates. Each employee should know the safe weight load and the safe height to which he can stack material on every truck in the foundry, and he should be taught to never exceed either. Overloaded trucks also create a hazard because of the lessening of the sense of responsibility for their safe use that the "hurry up" attitude creates.

Secure cumbersome loads safely before any truck is moved. Many accidents occur when an employee reasons that he has to move such a short distance that there will be no need for any extra rigging or safety precautions. He should be impressed with the fact that a movement of a single foot can cause an accident that may damage the goods being hauled, the truck, himself or some other employee.

Hand Trucks Should Be Pushed

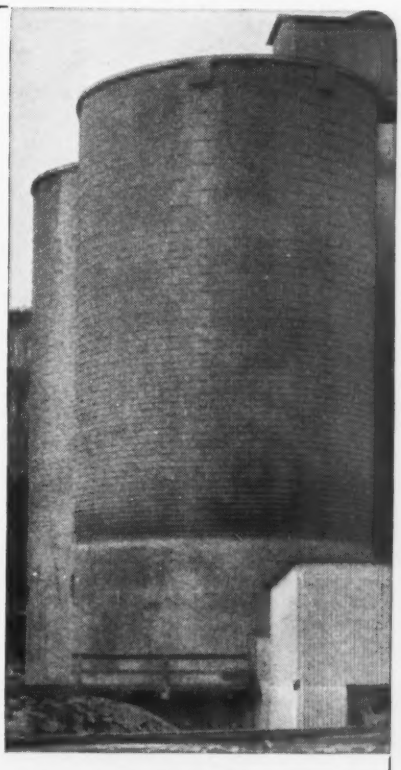
Push hand trucks—never pull them. Statistics show that many accidents are caused by pulling heavily loaded trucks. Usually these accidents cause an internal injury to the employee involved.

Balance loads properly, even if it takes a little extra time to do so. Every type of truck, hand or power, large or small, has been designed to operate efficiently when the weight is evenly distributed over its wheels. On two-wheel trucks, this point is even more important than on four-wheel vehicles. Lopsided loads not only cause excessive damage to the truck being used, but create a tremendous accident potential.

Every foundry should have a rule forbidding riders on power trucks, and it should be applied without exception.

Physical strength of employees is very important in the use of all trucks, especially the hand type. Individuals lacking the necessary physical strength should never be assigned to such jobs.

2 of the 6 Neff & Fry Bins at National Gypsum



These two 30′ dia. x 66¼′ high bins are used by National Gypsum Co. at Bellefonte, Pa., for handling and storing raw lime from the kiln.

We've had experience in erecting bins and helping to design conveying systems for nearly 100 kinds of flowable bulk materials. This experience will prove valuable to you if you have such a project in mind.

There are many advantages in our type of bin construction. The outstanding feature is the Super-Concrete Stave with diagonal ends—dense and hard, does not spall or rust or burn.

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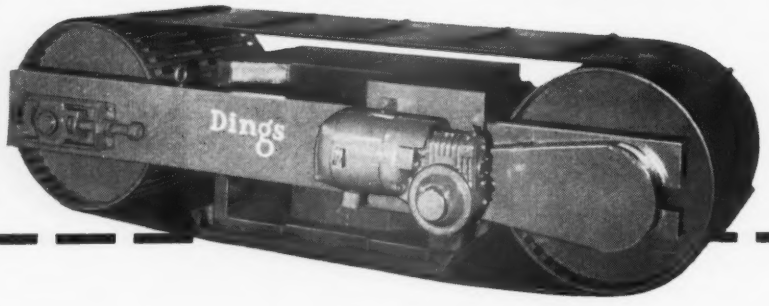

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Suspend a Dings Self-Cleaning Rectangular Magnet over your conveyors and *be sure* of protecting your equipment from tramp iron damage. Operating automatically and constantly, these Self-Cleaning Magnets pull tramp iron of any shape out of deep burdens on the fastest moving belts. Dings suspended "In Line" Magnets, which pick up and discharge tramp metal in the direction of material flow, are particularly effective for quickly removing long rods from sand before the trailing edge can damage the conveyor belt.

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With a Dings Self-Cleaning Rectangular Magnet on the job, there are no production delays for hand removal of tramp iron . . . no downtime for repairing damage to machinery caused by tramp iron. Self-cleaning magnets discharge accumulated iron automatically . . . no manual labor required.

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There's a growing need today for scrap metal to meet the demands of an expected record steel production year. You can add to your profits by turning recovered tramp iron into money.

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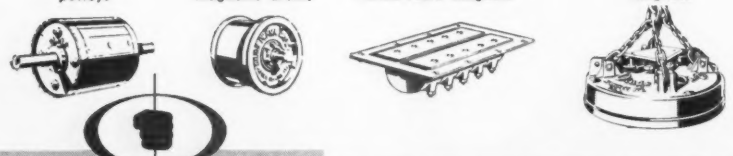

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Labor Shortage Calls for Better Personnel Methods

Tight Labor Market Seen To Continue in 1956

EMPLOYMENT in 1955 stood at an all-time high of 63 million, with less than 4 per cent of the labor force unemployed, reports Industrial Psychology Inc., national psychological research organization. "We shall see an increase in unemployed in 1956, but the tight labor market will still be with us."

What can the personnel director do to fill job vacancies with properly qualified employees in such periods of high employment? There are three areas that deserve some thought.

First, recruiting should be improved if necessary. The *quality* of company personnel often is directly related to the *quantity* of applicants obtained for screening. Studies show that for every ten clerical or factory applicants, only between five and six can meet the mental qualification standards for the job. Screening of from four to eight applicants for each job opening in the company is a good rule of thumb.

Many personnel men have become complacent about recruiting—resigning themselves to the theory that in a tight labor market, you have to hire the applicant if he is "warm." Recruiting, like selling the company's product, must be approached aggressively, with a constantly active program and use of all available sources and media. Unemployment for February and June, the usual high unemployment months, is predicted to reach four million in 1956—so there will be job applicants if you promote the fact that the company has vacancies.

Second, avoid the psychologically underqualified. "Warmth" cannot be the only standard job qualification in this year's employment policies. With investment in employees running $500 at rank-and-file levels and over $5000 at key personnel levels, the personnel director needs to take a careful look at the applicant before he puts him on the payroll and starts company investment in him. This means checking out the applicant to see that he has the brainpower to do the job, that his interests and personality are adapted to this type of work and that he shows sufficient maturity and stability in his background. This check should use both modern personnel tests and the newer interviewing techniques.

From the job-tests, you obtain a level of qualification for the appli-

cant, based on national standards of job efficiency: UQ—underqualified, Q1—minimum qualified, Q2—well qualified or Q3—best qualified. Numerous studies have shown the fallacy of hiring the UQ applicant. After six months on the job, his wages plus overhead will be more than his production expressed in dollars and cents. There is a certain point in psychological qualification below which it is not good personnel-sense to hire, regardless of how tight the labor market.

Another aspect about hiring qualified people is to be sure they are placed on a job requiring their abilities. Many companies talk about the great shortage in engineering and other technical personnel; but when these job assignments are analyzed, about 40 per cent of the duties could be performed by a person who does not have the degree, but could meet the psychological qualification for the job. Also, it is well to take a look periodically at present employees, particularly those whose production is just passable, to see if they are psychologically qualified to do the job.

Third, follow up on newly hired personnel. The highest point of turnover in most companies is in the first six months on the job. In a period of tight labor market, employees tend to be more critical of the job and the company. Jobs in 1955, for example, were very easy to obtain; thus a large number of employees moved from company to company. These turnover losses ran into millions of dollars in 1955 alone. The labor market for 1956 is going to be pretty similar to the 1955 situation. Thus it behooves all companies to check their personnel policies and procedures, to see that they can hold a good employee after they have obtained him.

Fields to check include written company policies and procedures for personnel; job description and job-evaluation standards; salary structure and equitable salary administration plan; performance rating plan and progress review for individual employees; periodic morale surveys; standard and equitable methods for transfers and promotions; and employee benefit plans. The company that has 1946 practices in these areas in 1956 will pay the price in labor turnover and poor employee morale, with accompanying substandard production. Company increases in personnel costs can be passed on to the product price for just so long. Eventually, competition, using modern personnel practices, will remove the company's market.

Further information on personnel techniques for a tight labor market may be obtained from Industrial Psychology Inc., Research Center, Tucson, 6, Ariz.

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Trouble Shooting

By C. W. AMMEN

Dear Charlie:

From a technical standpoint, the question of how many castings to make in a flask may not be considered a problem, but it's one to me, nevertheless. A local purchaser of large quantities of very small red brass castings asked us recently whether we would like a portion of this work at a maximum price of X cents per pound. After we had looked at the equipment, the X price per pound seemed high. In fact, we felt that at that maximum we would get fat on the job or perhaps give the buyer a much better price and make our competition come in off the golf links and sharpen their pencils.

The equipment was two 12 x 18-in. pressure plates with 25 patterns on each and no cores. Specifications called for red brass with a minimum of 81 per cent copper. Castings were to be free from shifts, sand, flash, inclusions and free iron and to be uniform in size.

Taking on a trial run of several thousand each at the maximum X price, we discovered that the price was not too high at all. Try as we may, we scrap out about half because of small shifts, ramoffs, misruns and flash. After sorting and inspection, we come out with enough left to ship to make a small profit at the X price. Flask equipment, incidentally, is 12 x 18-in. steels with new pins and bushings. These castings cost the customer too much.

Sincerely,
Sam

How Many Castings in a Flask?

Dear Sam:

Your problem is as old as the foundry industry, and for my part is getting somewhat bigger. I have gone very carefully over the samples you sent, and you would have no more trouble trying to run darning needles in a 12 x 18-in. flask under the hook and to keep them from shifting.

The first thing that comes to a foundryman's mind 90 per cent of the time is, "How many patterns can I get into a flask?" He usually decides that the more the merrier. He reasons that it doesn't matter what he gets in good, salable castings per day at a given cost, that it stands to reason that if he can get more in, he will get more out, regardless of the scrap. Don't you believe it! The point of diminishing return in relation to pattern and flask size is not only a reality, but a very fine point, overlooked time and time again by the unwary foundryman.

The job you speak of was no doubt priced on the basis of what is known as a built-in scrap factor. At one time I worked for one of the Big Three automotive firms and ran herd on a number of small foundries which made a wide assortment of castings. These outside vendors for the most part were well equipped and in many instances were making duplicate castings from duplicate equipment furnished by us. Price-wise, they were competitors.

Once I had six duplicate sets of equipment for a pump component in six outside shops—12 x 18-in. matchplates with 20 small parts to the plate. Everybody was happy until a small shop, one of the six, sent in a price chop which looked like he wanted to commit suicide or was stealing his ingot. It amounted to about a 15 per cent cost reduction per part to us. Thinking this bird needed a head doctor at once, I took the iron bird that night to root him out and apply the ice bag myself. (I had figured the price on the job to start with, and this boy threatened my security.)

What did he do? You guessed it—he was running the job in a 12 x 12-in., with very close pins and bushings, ten pieces to the flask, and pouring in the center. He got more molds per day, a drastic reduction in scrap, lower pouring temperature, higher casting yield per flask per pound poured, etc. And he wound up with 25 per cent more castings per day.

Sounds like a fairy tale, doesn't it? Of course, on cored work such as sweat fittings, plumbing ware, etc., the cores help to a great extent to prevent shifting and other problems.

The use of offset plates help to some extent, and there are several devices on the market to prevent shifts, etc. However, using flasks, pins and bushings of the proper size for a given job is by far the best approach. A small flask with one round and one broached with a pin-to-bushing clearance of 0.005-in. will produce more scrap than a small flask with two round bushings with a 0.010-in. clearance, even though this clearance is 0.005-in. greater. In a medium-sized flask with one round and one broached bushing, clearance should be at least 0.010-in. Large flasks should have a minimum of 0.010-in. clearance on the broached end and 0.015-in. on the round end.

Since pouring temperature must be raised above normal to catch thin or small castings out on the end, the ones closest to the sprue are poured much too hot, and the number of molds you can pour from a ladle before getting excessive misruns is reduced. Generally speaking, on small castings, cored or uncored, if you cannot pour 85 per cent of a No. 60 crucible full of metal at the correct temperature on a given set of molds without excessive misruns or abnormal pouring temperatures and excessive gatings, you have too many castings per flask. Make small castings in small flasks and large in large flasks.

Flask Size Must Be Reduced

As the machine finish dimension reduces, you must reduce the flask pin to bushing clearance, and this you can do only by reducing flask size. As you stretch the molder's arms out and make the cope heavier, you decrease his accuracy of draw and close to a point where he must have more clearance. A 12 x 20-in. flask with a 0.010-in. round bushing on each end never could be lifted straight enough to keep it from jamming, but a flask 10 x 10-in. would give no trouble at all.

It is common to find matchplates used to make castings which have only 0.025-in. machine finish allowed with lugs which have 0.030-in. slop on the pin. The molder starts out to make the drag with the 0.030-in. to the back of his machine, and when

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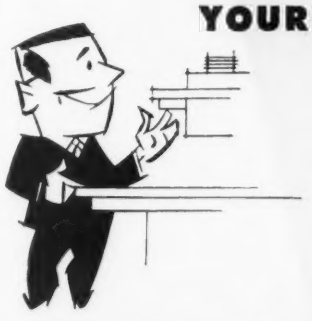

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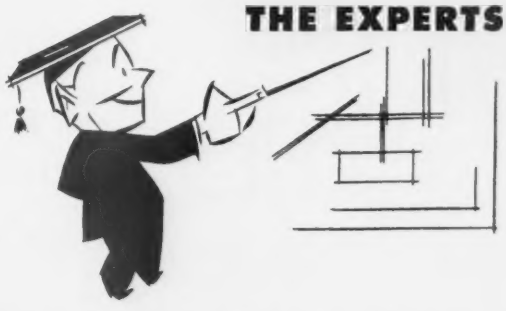

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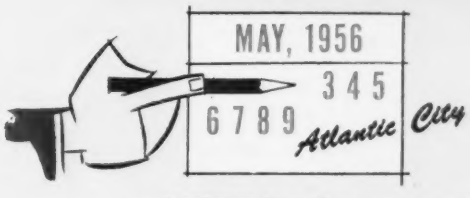

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he rolls it over to make the cope, he might take up 0.030-in. to the back again, coming up with a total of 0.060-in. shift—or, at best, 0.030-in. machine finish on one side of the casting and zero on the other side. Castings made in sand to go over chucking machines must be close and all the same size, or some customers will look to different materials and processes. Make no mistake about it: Lots of metal castings have been replaced by nonmetal, etc., because of such humbug.

Most flask manufacturers recommend a minimum of 2 in. of sand between the patterns and the flask to minimize flask distortion from excessive heat and to give sufficient bearing surface. Now you can make book on it that if there is 2 in. all around any job in a 12 x 18-in. flask, that's where we are going to stick a runner or something else.

Gating System Is Vital

One of the most important things conducive to the production of good castings is a properly designed gating system, and as much care should be exercised in the design and construction of the gating system as in the pattern itself. After all, this is the lifeline to the casting. This can be done only by carefully designing the gating system for a given pattern or patterns and then selecting the proper size of flask to fit pattern, gates and all, not by first seeing how many patterns can be crammed on a plate and then hoping to squeeze some sort of gates, runners, sprues, etc., in the remaining space. No one knows how many matchplates, etc., have been built only to have it turn out too late that there was little or no room to change or alter a gating system which was a bad guess to start with.

I have seen many myself and am responsible for more than I care to admit. I have run plates so nearly full of patterns that it was impossible to effect any kind of a choke or prevent excessive loss. You are asking for trouble when you tell the patternmaker to see how many patterns he can get on the plate and then to put in what he can in the way of gates.

Ever catch a pressure-cast match plate in which all the patterns are jammed up against one side of the flask with the runner and ingates down the other side only to find out that the castings are gated on the wrong end? Have you ever made one like this? It's a good bet you have.

In many cases the following defects are caused by improper pattern or flask equipment or the combination of both: 1. Runouts, weepers. 2. Crushes. 3. Stickers. 4. Drops. 5. Rough castings. 6. Penetration. 7.

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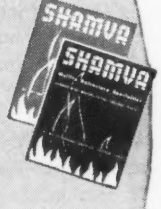

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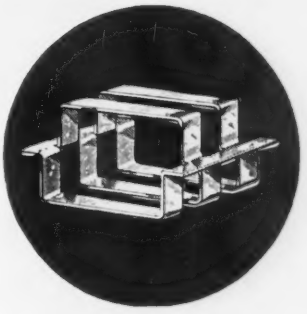
In order to get the most out of it, the following few simple rules which we know but often overlook will help to reduce scrap losses: 1. Don't put too many patterns on a plate. 2. Don't run family plates in production. 3. Avoid patterns that are too smooth or too rough. 4. Place patterns when possible in such a position in the flask that the face or section most likely to ram off is at right angles to the front of the molding machine—that is, facing either pin. 5. Keep molding machines parallel between head and table. 6. Squeeze with rigid squeezer board inside the flask. Do not squeeze with a board or head which is larger than the inside dimensions of flask. 7. Allow at least 2 inches of bearing surface (sand to sand) around the inside of flask.

In addition: 8. Allow ample space for correct gating. 9. Allow ample sand over patterns, cope and drag. 10. Keep pins and bushings in good shape and to size. 11. Use well fitting, rigid bottom boards. 12. Place finished molds on a flat surface or on conveyers kept in good shape. 13. Allow sufficient space between patterns. 14. Avoid placing patterns too close to the down sprue. 15. Avoid warped or thin plates. 16. Arrange patterns in the flask in such a manner as to get the most even ramming and mold density over the entire area. 17. Place patterns with greatest draft front to back. 18. Avoid the use of cheap shellac and clay gates. 19. Use bushings in matchplates. They are far more accurate than lugs.

Sincerely,
Charlie

"That's the 'Hollywood' in our foreman. . ."

CHAPLETS



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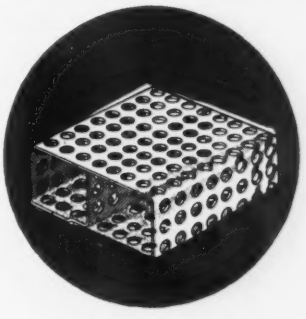

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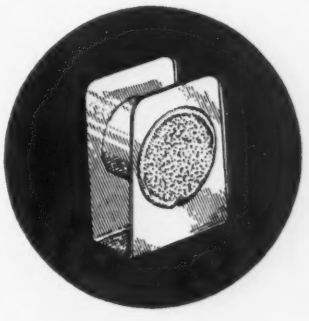

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Meditations of a Sandman

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

WHEN there are certainly more important things to be done in the world, why should a man devote time and energy to writing a column such as this? It provokes little serious thought, has less of technical value, cannot possibly qualify as humor and such philosophy as it may contain hardly can be considered worth the effort, either to author or reader. In fact, the whole thing might be summed up as idle thoughts of an idle fellow, talking mainly to himself.

Now we come to *you,* gentle reader, who encourages this sort of thing by the very attention you now are devoting to it. Haven't you any defective castings to argue about or hot sand problems to deepen the wrinkles below your graying hair? Or perhaps you're having family troubles or the memories of a sinful life are plaguing an aging conscience? Well, whatever your reason for turning to the old Sandman's meditations, I welcome you to this exclusive and discriminating group of readers who thus seek respite from the sordid thoughts of a work-a-day world!

My mail in response to these monthly essays has increased at least 100 per cent. This month, my *lone letter* was from a foundry poet, a kindred soul, whose verses have brought enjoyment to many a weary foundryman and to others in recent years. He flattered me no end by saying that he enjoyed this stuff of mine, and especially my December effort, "Romance of Foundry Sand." As evidence of his sincerity, he presented me with a beautifully bound copy of his selected poems, *Rammed Up And Poured.* You've guessed it: My correspondent is Bill Walkins of Electric Steel Foundry Co., Portland, Oreg. I believe Bill now is the only foundry poet in captivity. He explains in his preface, "These poems were not written; they were rammed up and poured."

Apparently Bill and I have a good deal in common. We both have served an apprenticeship on the muller, have digested daily the complaints of both boss and molder and in our moments of solemn meditation

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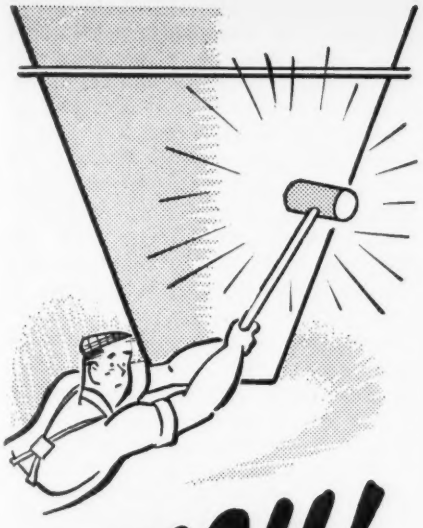

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have wondered whether there may be a final reward in paradise for a sandman. Despite the "hard work, heat and noise," each of us has sensed an inspired purpose in the seeming confusion of sand, sweat, and smoke and has attempted to express it in metered words (mine have long since been consigned to a wastebasket, just as some of my love letters should have been). But Bill Walkins has produced foundry verse which deserved publication, and this it has received in a beautiful and enduring form.

I suppose that the word *poetry* never has been defined satisfactorily. Various adjectives have been employed in the endeavor to evaluate and classify it. There are major and

give

minor poets, rhymesters and those who grind out doggerel (presumably the lowest form of verse). Yet each will find his audience and completely satisfy its literary level. There are those who prefer Dante and Milton, and those who gush over Edgar Guest, Kipling, or Robert Service. If Kipling is your idol, you probably would be bored to sleep by Milton, and vice-versa. I imagine that poets are happiest when looking down their noses at each other, at least those whom we term high-brow. So, in poetry as in other things, we like what we like and should refuse to be overawed by those who pretend to breathe the atmosphere of Olympus.

I shall assume that the average man has an acquired distaste for poetry in general. In youth, we were forced to memorize poems and also to eat spinach. In both instances, the *forcing* caused a revulsion, and we came to look upon poetry as "stuff for sissies," something any red-blooded boy should be slightly ashamed of. Yet, later, we learned to our surprise that the writing and publishing of poetry always has been big business and that some knowledge of it is es-

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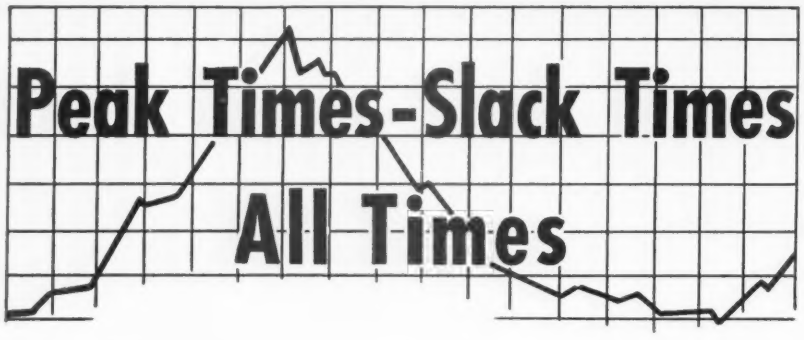

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sential to a well-rounded education. Perhaps we also learned that the reading of certain poetry, in moments of repose, could prove downright enjoyable and give us a deeper respect for the power of words.

Despite our youthful distaste for rhyme and meter, I suspect that there is a little bit of poetry in every man. I've known molders who came up the hard way, who were rough and tough, and prided themselves on "learnin' by doin' an' not dependin' on no damn books!" Yet in unguarded moments they would give vent to a measured emotion which might justly be labeled poetry.

At the age of eighteen or twenty, Abraham Lincoln, (with practically no formal education), expressed himself freely in flowing verse. His grandfather was a foundryman (a little known fact), and Abe may have inherited his gift for versifying, who knows?

Then of course there was Robert Burns, the bard of Scotland, whose verses have attained immortality. He also was inspired to dedicate verse to a foundry, even though his thoughts on the subject are somewhat disparaging. It seems that on one occasion he wanted to visit a foundry during wartime, but for security reasons was denied admittance. Somewhat discouraged and disgruntled, he repaired to a hillside a short distance from the plant. While watching the flames shoot skyward from the cupola stack, he wrote:

> In visitin' yer foundry,
> It werena that I wished to be mare wise,—
> But merely that in case I went to Hell
> I wouldna be surprised!

Thorndike defines the poet as "One who has great ability to feel and express beauty." Webster says much the same in other words: "One endowed with great imaginative, emotional, or intuitive power, and capable of expressing his conceptions, passions, or intuitions in appropriate language."

According to both Thorndike and Webster, Bill Walkins is a poet, and for my money, he's a very good poet. I don't know whether Bill is a graduate of an institution of higher learning or, like your old Sandman, failed to complete the requirements of a grammar school, but I do feel that he has eloquently expressed some of the thoughts which lie dormant and inarticulate in the breast of many a foundryman.

I have never met Bill Walkins and don't know a thing about him—good or bad. I've seen his picture and must say that he has a mighty pleasant face (for a man who has spent fifteen years on a muller). I'm sure that his company and his fellow workers are extremely proud of their poet. He doesn't owe me a dime, nor

I him, and I certainly feel no obligation to push the sale of his book. But, however unethical this may sound, I shall insist that any foundryman who can read English and has denied himself the pleasure of repeatedly reading *Rammed Up And Poured* has cheated himself of some very humorous and otherwise pleasant moments and perhaps of a worthwhile sobering thought or two. After a first reading of these delightful poems, you even may get the urge to do a little of your own versifying. Who knows, you might compose something as *brilliant* as this:

THE SANDMAN

The molder may ram 'til his drag's like cement,—
Or the core be decidedly green:
Or both mold and core clearly lacking a vent.
Who's to blame, when the blow-hole is seen?
The Sandman!

If the facing's too dry, or a little bit wet,
Or the strength is two-tenths up or down,—
Or the stuff doesn't patch as it should, you can bet
There is one guy who'd better leave town.
The Sandman!

When the chipper continues to grind and grind
On a casting deformed by a "swell":
And the shipping department's three days behind.
Who gets particular Hell?
The Sandman!

If the gate isn't right, or the riser's too small,
And you don't know just whom to abuse:—
There's one little guy who says nothing at all.
He's the fellow with clay on his shoes.
The Sandman!

Labor-Management Relations Subject of AMA Booklet

"Frontiers in Labor-Management Relations," No. 164 in its personnel series, has been issued by the American Management Association, 1515 Broadway, New York 36. The booklet contains four articles.

Prof. Jules Backman, New York University, shows what information should be available to a company to evaluate the practicability of supplemental unemployment benefits and reviews provisions of various SUB plans.

Basic industrial relations philosophy of U. S. Steel Corp. is described by John Stephens, vice president, industrial relations.

Malcolm L. Denise, general industrial relations manager, labor relations, Ford Motor Co., reports on the basic characteristics of Ford and the auto industry which help shape Ford's labor relations.

Robert C. Hendon, vice president, operations, Railway Express Agency Inc., provides a broad picture of "The Challenge of Tomorrow's Industrial Relations."

Copies are available from the association at $1 to members, $1.75 to nonmembers.

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ACTIVITIES of Foundry Groups

Pittsburgh: The Pittsburgh Foundrymen's Association officially became the 44th chapter of the AFS on Jan. 16, in a ceremony at Webster Hall Hotel, Pittsburgh.

The independent group had numbered 300, divided equally between company and personal members. It was founded in September, 1896, and has been in continuous existence since then. Members voted on Nov. 21, 1955, to join the national group. As the Pittsburgh chapter of AFS, the group will probably number about 400.

William W. Maloney, general manager of AFS, presented a cast iron rattle to H. C. Stirling, Pittsburgh chapter president. The rattle has been given to the newest AFS chapter since 1934. PFA officers were renominated to serve as officers of the Pittsburgh chapter, AFS. Also present from AFS were Thomas Kaveny Jr., regional vice president and national director and Harold Erskine, regional director and a national director.

Following the ceremony and dinner, Robert A. Colton, Federated Metals Division, American Smelting & Refining Co., spoke on "Better Aluminum and Bronze Castings." Mr. Colton is in charge of technical service for the eastern department of Federated Metals.

His firm has worked to improve production of brass, bronze and aluminum castings, and Mr. Colton answered numerous questions from the floor on specific problems. He then discussed problems in pouring, gating and risering. "In aluminum most problems come in pouring; in copper-base metals, gating and risering are the big variables," he commented. —*Robert M. Love.*

Connecticut: Newly formed AFS chapter met Jan. 24 at Cheshire, Conn., to hear a talk on "High Pressure Molding" by Thomas E. Barlow, sales engineer, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago.

Mr. Barlow indicated there are three chief considerations in high pressure molding: Even distribution of pressure to molding sand around the pattern, special sand requirements and good flask and pattern equipment. By the process, even packing of sand around pattern is assured with pressures of 80-120 psi. Diaphragms are of rubber, ⅜ to ½ in. thick and a typical life of 40,000 molds may be expected.

Sand must have good flowability. This is obtained through controlling grain fineness and distribution, moisture content between 1.8 and 3.5 per cent and sand additives (carbonaceous liquids compatible with water). Solid heavy-duty flasks are preferred but snap flasks may be used if an upset is carried around the top where applied pressures are greatest. For economical reasons there is a trend, with this process, toward use of larger flasks, which may be divided into multiple patterns or cope and drag halves. Matchplate patterns cannot be used. — *Gordon B. Mannweiler, Eastern Malleable Iron Co.*

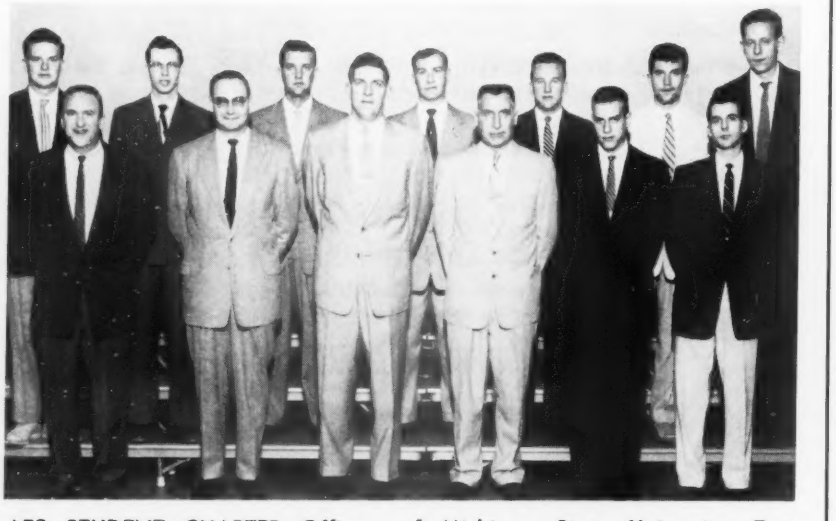
Cleveland Non-Ferrous: Nearly 50 members of the Non-Ferrous Founders' Society chapter met Jan. 19 at the Ranch Room, Cleveland Athletic Club, to hear Roy J. Carver, president, Carver Foundry Products Co., Muscatine, Iowa, discuss the CO_2 process. Walter O. Larsen Jr., Grafton Foundry Co., chapter chairman, presided and introduced the speaker.

Mr. Carver's talk emphasized the practice necessary to make the process work properly. For good cores, a washed and dried silica sand must be used. If the sand is coarse, a core wash is required, but coarse sands are too permeable for some nonferrous metals. Sand of 80 to 90 fineness is recommended. The finer the sand, the better the finsh, but more binder must be used as fineness increases. The least amount of binder that produces good results is the proper amount. Water-based washes may soften the cores. Solvent-based core pastes should be used.

Coreboxes good enough for conventional coremaking may not be good enough for the CO_2 process because any imperfections will show on the cores. Boxes should be polished and kept in good condition. Otherwise cores may stick. If a core sticks at all, rapping the box on the bottom will loosen it. Rolling cores with a chrome-plated rod gives better firmness than ordinary striking off. When cores are booked, both halves should be equally sticky and should be rolled or struck off at the same time.

In coreblowing, CO_2 in the air sometimes sets up the sand prematurely. The blow, therefore, should be timed for minimum duration, and to prevent stickiness as little binder should be used as possible.

Gassing can be done automatically



AFS STUDENT CHAPTER Officers of Michigan State University, East Lansing, Mich., for the 1955-56 academic year, posed recently with their industrial and faculty advisers. Front row, left to right, are Jack Macaulay; Jack Lane, chairman; Richard Dobbins, industrial adviser; C. C. Sigerfoos, faculty adviser; Ronald Friedman, vice chairman and Rennie Swope, secretary. Back row, left to right, are Marvin Van der Ploeg; Clarence Chambers; Dale Freeman; Walter Rebro; Norman Marine; Carl Lutz and Robert Cadwaller. Kenneth Priestley, industrial adviser, was not present

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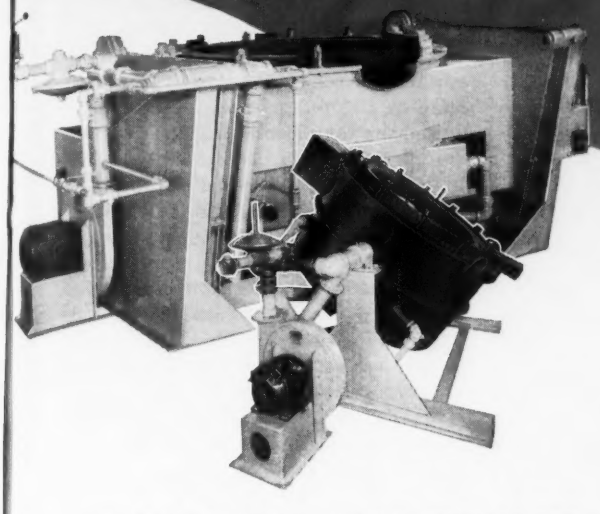

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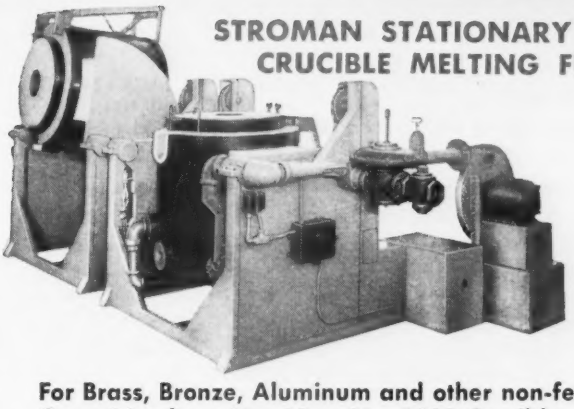

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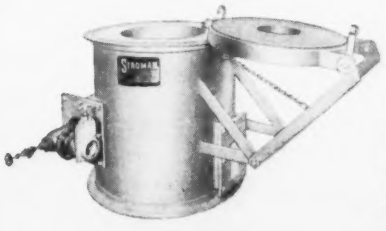

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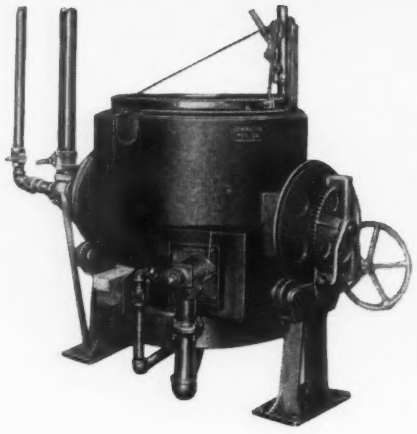

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or manually, but good production rates call for automatic apparatus. Undergassing is preferable to overgassing. Good mulling equipment is important, and mulling time should be short. Neither mulled sand nor binder should be permitted to sit out in the open. Mulled sand should be kept covered to prevent crusting over. —*Jack C. Miske.*

Western Michigan: Schuler Hotel, Grand Haven, Mich., was the site of the Jan. 9 meeting of the AFS chapter. Robert Green, Bay State Abrasives Co., Westboro, Mass., spoke on "Grinding Wheels in the Foundry Industry." Mr. Botwinski, Liberman & Gettlen, Grand Rapids, Mich., discussed "Some Practical Aspects of Ingot Brass Founding."

Mr. Green discussed foundry grinding and snagging of cast iron and steel and economies obtainable from proper selection and use of abrasive wheels.

Mr. Botwinski showed a film, "Quality Control of Copper Base Alloys," and discussed the melting of high-conductivity copper, control of lead sweat in high-lead alloys and the effect of flame control in melting silicon and aluminum bronzes.—*Joe Cannon, Muskegon Aluminum Foundry Co.*

Wisconsin: The CO_2 process was the subject of Carl G. Presser, assistant director, Gray Iron Research Institute, Columbus, O., and L. E. Emery, chief metallurgist, Marion Malleable Iron Works Division, Chicago, Railway Equipment Co., Marion, Ind., at the Jan. 13 meeting of the AFS chapter at Hotel Schroeder, Milwaukee. Attendance was 270.

A film on the process, showing its practical applications, was shown. Mr. Presser reported on the activities of the institute in the CO_2 process. Mr. Emery related his company's experiences in bringing the process through experimental to production stages.—*John E. Hubel.*

Twin City: "How to be Happy" was the subject of Leonard Cole, safety engineer, Crane Co., Chicago, as he addressed 78 members and guests of the AFS chapter at Covered Wagon Restaurant, Minneapolis, Jan. 10. Discussing management and supervisory responsibilities in safe plant operation, Mr. Cole emphasized the essential components of the "frame of mind" that must permeate the entire organization.

Basically, according to the speaker, good safety practice involves taking safety problems seriously. Taking safety lightly is a threat to production. Anything that interferes with production is worthy of investigation

and every effort should be made to correct such interruptions. — *R. J. Mulligan, Archer-Daniels-Midland Co.*

Eastern New York: January meeting of the AFS chapter attracted 50 members. Clyde Sanders, American Colloids Co., Chicago, was guest speaker and presented a general discussion of the foundry industry. Mr. Sanders indicated that the old-time molder is gradually disappearing, mechanization is expanding and small foundries are dissolving as operations speed up and get larger.

Speaker questioned the claims of new processes. He feels that by using good patterns, replacing worn out equipment, using finer sands, good gating practice and controlling human error, green sand castings can be produced to as high a quality as castings produced by any of the new methods. Slides illustrating common casting defects were shown. Causes and remedies for each type of defect were discussed.—*Martin L. Slawsky.*

Washington: AFS chapter met Jan. 19 at Stewart Hotel, Seattle, Wash., and heard Charles Vokac, Whiting Corp., talk about "Electric Melting Equipment." Mr. Vokac emphasized the versatility of the direct-arc furnace as a prime melting unit and as a component of duplexing operations in an iron foundry. Speaker pointed out developments in arc furnace regulation and explained how improved regulating systems can provide efficient heat input in the furnace. He stressed the importance of proper reactance in the transformer circuit in order to produce the optimum load factor in relation to power factor. — *Harold R. Wolfer, Puget Sound Naval Shipyards.*

Chicago: Four roundtable sessions provided the technical program for the Feb. 6 meeting of the AFS chapter, at the Chicago Bar Association. Chapter President James T. Moore, vice president, Wells Mfg. Co., presided at the business portion of the meeting.

Membership Committee announced it had overshot its target of 800 members and as of that date had reached 814, a gain of 25 over the previous month. It also was announced that the annual stag outing will be limited to an attendance of 500 and will be restricted to members only.

Some details of the Lecture Course to be conducted in March were outlined. The chapter's meeting on March 5 at the Bar Association will kick off the three-session course on "Product Improvement." Speaker will be Nathan Levinsohn, foundry

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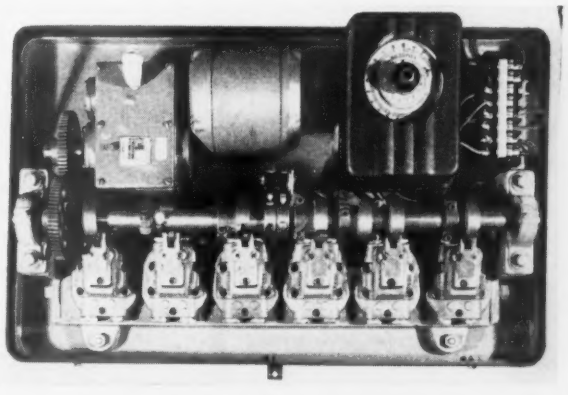

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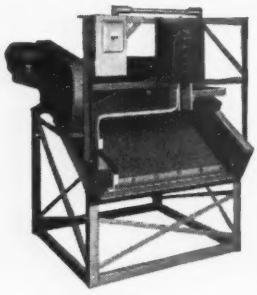

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superintendent, Minneapolis - Moline Co., Minneapolis, who will speak on the theme topic. Second and third sessions of the course will be held on succeeding Monday nights, March 12 and 19, at the auditorium of Peoples Gas, Light & Coke Co. The course will cover processes, materials and other foundry matters as they relate to product improvement.

Chapter Vice President Robert P. Schauss, Chicago manager, Werner G. Smith Inc., introduced the chairmen and participants in the four roundtables.

The Gray Iron and Maintenance Divisions combined to hear E. J. Jory, Lester B. Knight & Associates Inc., discuss "Progressive Mechanization on a Small Budget." John Durrant, South Works, United States Steel Corp., was chairman. David Kindt, Kindt-Collins Co., Cleveland, spoke before the Pattern Division on "Research in Pattern Coatings." Eric Bergstrom, East Chicago Pattern Works, presided.

The Malleable and Nonferrous divisions joined to see the AFS sound movie, "Study of Fluid Flow Through Vertical Gating Systems." "Welding Rods and Equipment" was the discussion subject for the Steel division, with W. G. Rinehart, Harnischfeger Corp., Milwaukee. Frank Satek Jr., Continental Foundry & Machine Co., was chairman.

The Chapter's Annual Ladies Night party was held at the Knickerbocker Hotel, Feb. 11. Attendance was approximately 600.—*Erle F. Ross*

Reading: Dr. W. H. Ruten, professor of mechanical engineering, Polytechnic Institute of Brooklyn, N. Y., spoke to nearly 100 members and guests of the Reading Foundrymen's Association at the Berkshire Hotel, Reading, Pa., on Jan. 17. Dr. Ruten's subject was "The Foundry is a Good Place to Work." Vocational guidance instructors from all the junior and senior high schools in Reading and Berks Counties were guests of the chapter. — *W. I. Cassidy.*

Northwestern Pennsylvania: The AFS chapter assembled at the Moose Club on Jan. 23 to hear John Gotheridge, Foundry Services Co., Columbus, O., discuss the CO_2 process. Jacob Diemert, Erie Casting Co., presided and Edwin J. Bonesteel, General Electric Co., served as technical chairman.

Mr. Gotheridge illustrated his talk with slides showing how the strength of CO_2 cores varies with clay content, moisture, binder and time. Speaker elaborated upon the chemi-

cal principles involved when CO_2 gas is united with sodium silicate and how the resultant silica gel makes the sand grains adhere to each other.—*Walter J. Yahn, American Sterilizer Co.*

San Antonio Section: Harry W. Dietert addressed 57 members and guests of the AFS chapter on Dec. 19 at the Alamo Iron Works, San Antonio, on "Casting Defects Due to Sands." Refreshments were served by the San Antonio Machine & Supply Co.

George E. Miller, Federal Foundry Supply Co., Cleveland, spoke before 51 members and guests of the chapter on Jan. 23 at San Antonio Machine & Supply Co., San Antonio, Tex. Mr. Miller presented an illustrated talk on coreblowing and coreblowing machines with emphasis on their benefits and functions. Coreboxes and venting were discussed at some length. Refreshments were served by W. H. Winterborne & Sons.—*Frank A. Fournier Jr., F & J Pattern Works.*

Canton: Ninety-two members and guests of the AFS chapter met Jan. 5 at Mergus Restaurant, Canton, O., to hear A. J. Dublo, chief metallurgist and quality control engineer, Sterling Foundry Co., Wellington, O., discuss "The Cupola." Chapter Chairman H. A. Biddinger, F. E. Myers & Bros. Co., Ashland, O., presided. Speaker was introduced by Vice Chairman W. W. Snodgrass, Massillon Steel Castings Co., Massillon, O. J. Johnson, Bonnot Co., Canton, was host to the speaker.—*R. R. Kozinski, Canton Malleable Iron Co.*

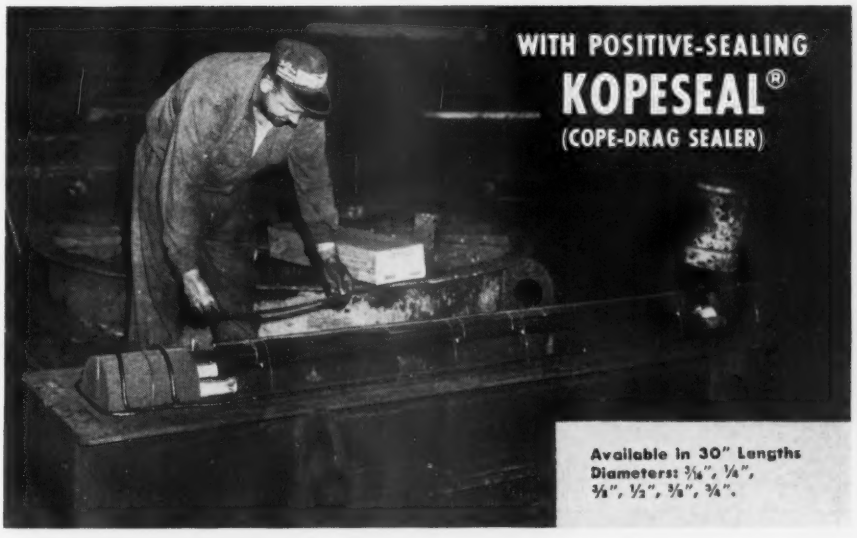
Birmingham: AFS chapter's annual Christmas party was held Dec. 16 at Cascade Plunge, Birmingham. A delightful floor show, dancing and dinner provided entertainment for the 140 members and guests attending.—*Paul B. Sullivan, U. S. Pipe & Foundry Co.*

Northeastern Ohio: About 160 foundrymen and guests braved an evening storm on Jan. 12 to hear Charles Walton, technical director, Gray Iron Founders' Society, Cleveland, discuss "Principles of Risering" before Northeastern Ohio Chapter of the AFS at the Tudor Arms Hotel, Cleveland.

Mr. Walton pointed out that risers have the following five purposes: To vent the mold cavity, to avoid the hydraulic ram effect, to indicate when a mold is full, to flow off cold metal and to absorb contraction. The last purpose probably is the most important. Contraction has three phases—liquid, solidification and solid contraction. Solidification contraction

even in this long, narrow mold

RUN-OUT IS ELIMINATED



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PRESSTITE SEALING COMPOUNDS
PRESSTITE ENGINEERING COMPANY
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poses the largest problem.

Different types of metals solidify differently and require different handling. Regulation of solidification involves such factors as latent heat, volume of metal, casting surface area and ability of the mold surface to absorb heat. The last is affected by gating and chills. Mr. Walton also discussed directional and nondirectional solidification, the importance of necking risers properly, and the solidification characteristics of various metals. His talk was supplemented by slides.

The chapter's educational committee will sponsor a television show portraying the foundry industry in cooperation with the Cleveland Technical Societies Council. Entitled "The Challenge of the Foundry Industry" the half-hour program will be presented at 12 noon Sunday, Mar. 25 over local station KYW-TV.

Molds will be rammed and poured to demonstrate how a casting is made. Tentative plans, which require the station's approval, include melting metal in a miniature cupola. Local foundrymen will present the commentary and conduct a question and answer session with high school students.—*Jack C. Miske and Robert H. Herrmann.*

Company's Expansion Includes Building of New Pipe Plant

James B. Clow & Sons Inc., Chicago, producer of cast iron pressure pipe, will break ground at Bensenville, Ill., by early summer for a new cast iron pipe plant. First of its type to be built in the Chicago area, the plant will have capacity for 80,000 tons of pipe a year for use primarily in municipal water and gas distributing systems. The plant is part of a $5 million expansion program of the company's manufacturing facilities.

Production from the new plant, located about 16 miles northwest of the Chicago loop, will supplement output of Clow's two other pipe plants in Coshocton, O., and Birmingham, Ala. Located on a 58 acre site, it will provide some 150,000 sq ft of floor space, adjacent to railroad facilities. Completion is expected by mid-1957.

Main part of the structure will house melting units, machine shop and casting operations. A wing will house annealing, finishing and testing facilities.

Other phases of the Clow expansion program include modernizing the fittings foundry at the Birmingham plant and the purchase of additional land and buildings adjacent to its general offices and warehouse in Chicago to expand jobbing operations.

Bensenville plant will cast pipe at an average rate of one length a minute. Casting will be done centrifugally in metal molds in diameters 4 in. through 16 in. and in lengths of 18 ft. Casting operation is largely automatic.

Clark Equipment Sponsors Center To Handle Tests

Clark Equipment Co., Battle Creek, Mich., has opened its Materials Handling Development Center, established to develop material handling methods for individual industries. Clark's Industrial Truck Division is sponsor of the project.

Announcing the center, Robert H. Davies, vice president of the division, said, "Materials handling problems are becoming so complex it is difficult to develop a single handling machine or method that can be used by all industries. Emphasis must now be put on analyzing and finding solutions for handling problems of individual industries. . . . That is

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A dependable, LOW COST . . .
Motorized Brinell Hardness Tester by
Steel City Testing Machines, Inc.
● Positive accuracy
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● ¾" stroke
● For shop or laboratory

Now even the smallest shop can afford a dependable and versatile Brinell Hardness Tester. Priced exceptionally low, Model L is a motorized hydraulic machine with which even an inexperienced operator can make tests in strict conformance to A.S.T.M. Standards.

Engineered by Steel City, leader in the field since 1914, the new tester is designed for years of maintenance-free operation. The ¾" stroke permits successive tests without anvil readjustment. Load is applied by finger-tip pressure on operating handle.

Write for full particulars today and name of nearest sales representative—conveniently located in your area.

MODEL L
Vert. opening—9"
Throat depth—6"
Bench space—9" x 25"

Manufacturers of machines for testing physical properties of metals, including:

Steel City Testing Machines Inc.
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Brinell Hardness | Ductility | Tensile | Compression
Transverse | Hydrostatic | Proving Instruments | Flex-Tester
. . . and Special Testing Machines.

what the development center will do."

To indicate the scope of the project and increase awareness of material handling problems, the center is sponsoring a $5000 essay contest open to members of the American Material Handling Society. Ten cash awards will be given for the best papers on "Materials Handling in 1956." First prize is $1500. Winners will be announced by Clark at the Material Handling Institute Exposition in Cleveland in June.

Glen R. Johnson has been appointed director of the center. Formerly sales manager for Clark's gas-powered fork trucks and an industry specialist in warehousing and food handling, he has been associated with the company for 15 years.

Celebrate 100th Anniversary of Edward Goodrich Acheson

America this year is marking the 100th anniversary of one of its great inventive geniuses, Edward Goodrich Acheson, honored inventor, scientist and founder of the Acheson enterprises.

Mr. Acheson was born March 9, 1856, in Washington, Pa. He received his first patent—for a rock-boring machine—when he was only 17. In 1880 he bec. me an assistant draftsman for Thomas A. Edison at Menlo Park, and his inventive faculties soon were engaged in development work on lamp filaments.

Later, he went to Paris as first assistant to the chief engineer in charge of the Edison exhibit at the International Exposition. The electric incandescent lamp was introduced to Europe at that exposition. After its close, Mr. Acheson aided in the construction of power units, lamp factories and electric lighting systems, in France, Italy, Holland and Belgium. After his return to the United States, he founded the Monongahela Electric Light Co. in 1890.

While working on the reduction of iron ore, Mr. Acheson undertook experiments which led to the discovery of a new compound, silicon carbide, or Carborundum, as he named it. In 1891, the Carborundum Co. was formed at Monongahela, and four years later it was moved to Niagara Falls.

Some of his other major accomplishments included discovery of a process for making pure graphite and of a method of rendering graphite colloidal. For his work, Mr. Acheson received many honors, in-

GOT MELTING PROBLEMS?

Solutions to foundry problems often come easier to outside consultants. Get expert help; call for a Semet-Solvay metallurgist . . . he's a practical foundryman whose job it is to help you.

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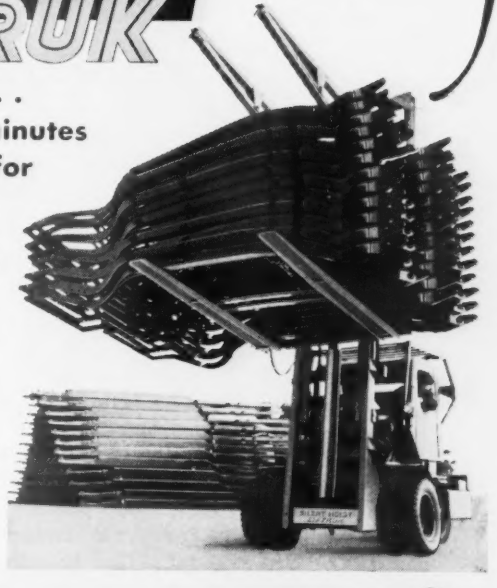
Ton Capacities
FLUID DRIVE
POWER STEERING

"72 frames per load . . . three lifts every four minutes . . . proves our needs for additional LIFTRUKS"

The SILENT HOIST Heavy-Duty Fork LIFTRUK so rapidly stepped up the production and movement of material, over past handling methods, that this Plant Manager (quoted above), was equally quick to anticipate *fleet* LIFTRUK operations in their plant. *Another example that LIFTRUK pays its way!*

Can we aid in solving your problems?
Send for Bulletin #77.



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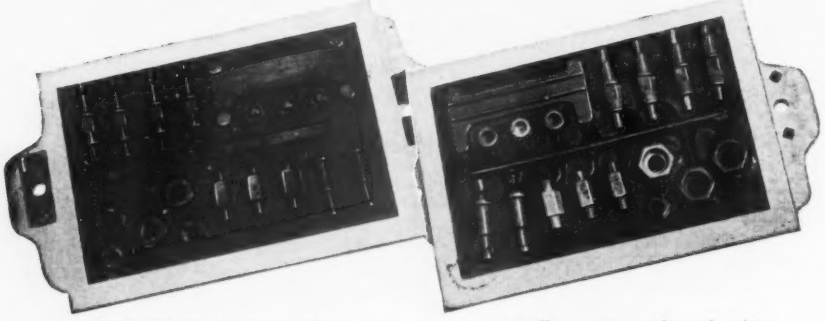
No wonder they call it . . .

SUPER TAMASTONE



● Wide variety of items made into combination match plate with metal patterns mounted in drag side.

● The cope side of this "nuisance" job is made entirely of SUPER TAMASTONE.

How SUPER TAMASTONE solved a "nuisance" job!

From single loose wooden patterns furnished by customer, white metal ones were made in multiples to balance out a short combination run. By converting these loose pattern odds and ends into a SUPER TAMASTONE Match Plate, the customer received work in record time at a big savings! The foundry was happy, too, another "nuisance" job out of the way, and profitably!

Super Tamastone will work wonders in your foundry too! Write!

TAMMS INDUSTRIES, INC., 228 N. La Salle St., Chicago 1, Ill.

cluding medals, prizes, degrees and other forms of recognition. In 1930, the Edward Goodrich Acheson Exhibit was installed in his honor at the Smithsonian Institution in Washington, D. C. Acheson Industries Inc. includes such divisions as Acheson Colloids Co., Port Huron, Mich.; Acheson Colloids Ltd., London; Gredag Inc., Niagara Falls, N. Y.; and Acheson Dispersed Pigments Co., Philadelphia.

Ajax Metal Division Honors Its Senior Metallurgist

To mark his 50 years of continuous service with Ajax Metal Division of H. Kramer & Co., Philadelphia, fellow employees recently honored Roger J. Keeley, senior metallurgist, with a dinner there.

A native of West Chester, Pa., Mr. Keeley joined the company as an assistant chemist and became field metallurgist 30 years ago. Active in the American Foundrymen's Society, he was president of the Philadelphia Chapter in 1940-1941. He is currently vice chairman of the national organization's Brass and Bronze Division.

ROGER J. KEELEY

Among those present at the dinner were 16 employees whose service with the company totaled 585 years. Only two who were present had longer service records than Mr. Keeley. Dr. G. H. Clamer, former president and now consultant, joined the company in 1896 and E. H. Brack, works consultant, started his service in 1902.

Others present with employment records exceeding 25 years included: Herman F. Oschell, 39; E. A. Oinkinger, 37; John Long, 32; Frank L. Middleton, 33; Sidney Danziger, 27; Russell Wigfield, 28; E. B. Owens,

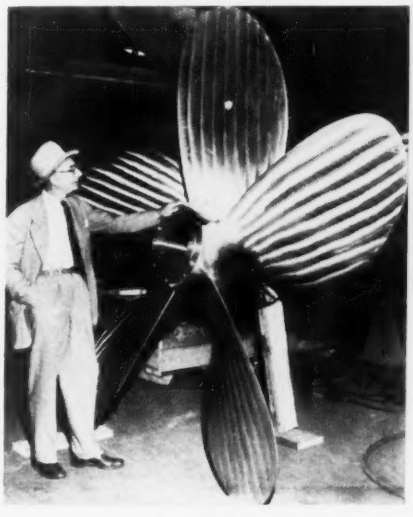
32; Louis Herrmann, 38; B. A. Stoltz, 27; W. J. Carroll, 31; Harry Cox, 39; W. P. Owens, 25; and George B. Street, 39.

Mr. Keeley was presented a gold watch in behalf of the company by Mr. Danziger, and a gift from the employees was presented by Mr. Carroll.

New Propeller Design Cuts Vibration on Ferry Boat

A 6000-lb manganese bronze five-bladed propeller of new design is providing passengers on the *Kalakala*—streamlined ferry on run between Port Angeles, Wash., and Vancouver, B. C.—with a smoother and more comfortable ride.

Since its launching in 1935, the boat has been plagued by vibration caused by a light hull, location of propul-



sion machinery and the vibratory sequence of four-blade propellers. Various propeller designs and compromises on engine rpm were tried without success.

Engineers of Coolidge Propeller Co., Seattle, designed the new propeller to accommodate the hull, give maneuverability and break up the sequence of hull and engine vibration harmonics. The specifications of the propeller, said to be the largest ever cast in the Pacific Northwest, are as follows: Diameter, 9 ft 8 in.; pitch variable, 7 ft to 7 ft 8 in.; developed surfaces, 41.64 sq ft; casting weight, 6000 lb and material, Federated No. 70 manganese bronze.

The *Kalakala* has a hull length of 265.1 ft, beam, 53.4 ft and draft, 18.7 ft. It is powered by a 3000-hp, 240-rpm diesel engine and has a speed of 18 knots.

Thor Power Tool Co. will transfer its executive administration offices from Aurora, Ill., to the new Prudential Building in Chicago in the fall of 1956.

OUR ERIE STRAYER BUCKETS WORK LONG HOURS, NEED LITTLE SERVICE

Reports Max Dozoretz, Partner, Lancaster Iron and Metal Co.

Clamshell buckets are put to many tough jobs. Probably the toughest is handling scrap metal. The constant brush of steel against steel lays up the ordinary bucket for frequent repairs and soon wears it out.

But not an Erie Strayer bucket! Mr. Dozoretz knows Erie Buckets. He has two of them on the job constantly. He says, "We work our Erie buckets hard—eight to ten hours a day, six days a week. We know they'll deliver full payloads with every pass.

"And we lose no time for maintenance! Our first Erie bucket has been in service, continuously, for six years now and is still going strong."

Compare the Erie with any other clamshell. You'll quickly note its finer engineering and the rugged construction that has made it the bucket preferred by experienced operators everywhere.

These Erie Features Mean More Days of More Work

1. Top closing power from block and tackle, plus lever arm construction, plus precision balancing.
2. Manganese steel teeth and high carbon steel lips that bite up full payloads of even toughest clay and gumbo.
3. Rigid, one-piece, welded head that shrugs off bumps and jars. No shimmy. No wobble.
4. Two-line, continuous reeving. Adds up to 50% to cable life. Less down-time for reeving.
5. Low head room for fast work in tight quarters; low center of gravity for easy positioning.

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For catalogs, write Dept. F36

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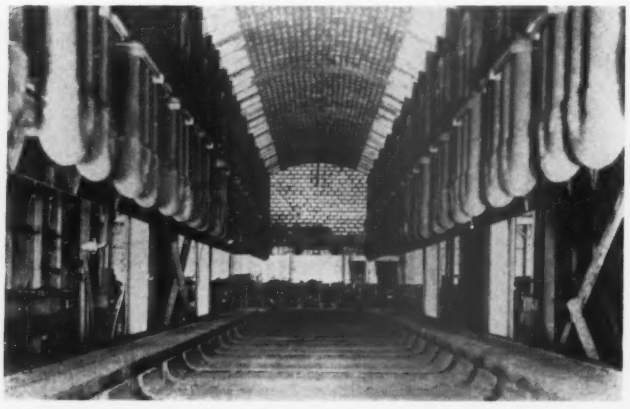
The Shakeout

Cast High Alloy Radiant Tubes Have Long Life

CAST HIGH ALLOY radiant tubes are aiding the increased popularity of radiant heating in industrial applications. In annealing cold rolled steel strip and sheet, for example, it is desirable to avoid surface corrosion by preventing the products of combustion from reaching the material being processed.

This goal is achieved by passing the hot gases through radiant tubes which reach temperatures varying from



1500 to 1750° F, depending on the particular treatment involved. For maximum resistance to these elevated temperatures and the products of gaseous combustion, radiant tubes usually are made of type HH (25 per cent Cr, 12 per cent Ni) or type HT (15 per cent Cr, 35 per cent Ni) heat and corrosion resistant high alloy castings.

The view above shows a radiant tube furnace for annealing and restoration of bar stock. The tubes have been in service for about 10 years and the supports for more than 4. Respectively, they are type HH and HT alloys and weigh about 250 and 100 lb.

For More Details Circle No. 104—Page 201

Beryllium Copper Castings Aid Taxi Meters

BERYLLIUM COPPER CASTINGS may prove to be the answer to a taxicab driver's prayer. Used in taxi-meters made by Viking Tool Corp., they have shown the ability to hold the close tolerances originally designed into them and to function properly after long use. Four different parts are made of a beryllium copper alloy manufactured by Beryllium Corp., Reading, Pa. Viking states that it possesses ideal casting characteristics and yields an end product consistent with original mold design. In most instances, the company claims, tolerances of 0.0005-in. can be achieved without additional machining.

For More Details Circle No. 105—Page 201

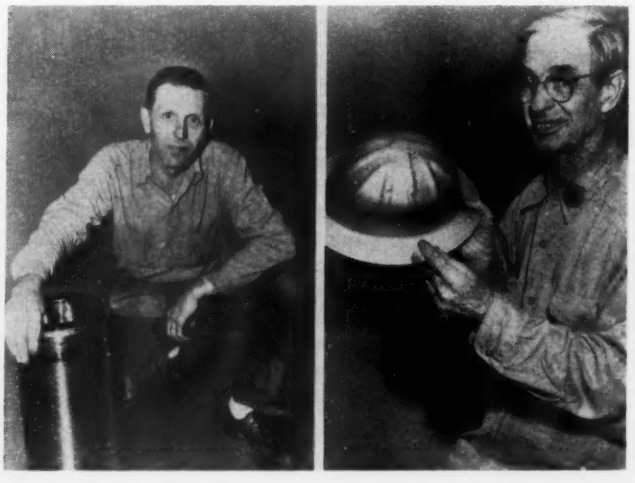
Spectrometer Aids Research in Metal Structure

THIS NUCLEAR MAGNETIC resonance spectrometer is a recent addition to the research equipment at the Metals Research Laboratories of Electro Metallurgical Co., Division of Union Carbide & Carbon Corp., at Ni-

agara Falls, N. Y. Checking readings on the unit is Dr. J. T. Rowland, who heads a project to evaluate its usefulness in the investigation of metal structures.

Safety Equipment Proves Its Value

THESE TWO MEN, employed at widely separated plants of National Supply Co., Pittsburgh, can testify that use of safety equipment pays off. Charles Curriston, right,



utility man in the maintenance department of the Torrance, Calif., plant, points to the dent put in his safety hat when a 6-in. bolt broke out of the foundry slag clam shell. Edward Erug, of the inspection department in the Toledo, O., plant, was grateful for his safety shoes when the 248-lb water cylinder liner shown in the illustration dropped onto his toes. Modern safety practices are enforced universally in National Supply's six plants.

PQ Silicate of Soda Service

Over forty silicates of soda, (liquid and dry), are available to meet industry's needs.

CONVENIENT PLANTS:

Deliveries from nine plants located in Anderson, Indiana; Baltimore, Maryland; Buffalo, New York; Chester, Pennsylvania; Jeffersonville, Indiana; Kansas City, Kansas; Rahway, New Jersey; St. Louis, Missouri; Utica, Illinois.

LONG EXPERIENCE

PQ silicates have been made since 1860. Helpful data on silicates and their uses available in PQ bulletins. Request a copy of PQ Silicates in the Metal Industry.

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1831—125TH ANNIVERSARY—1956
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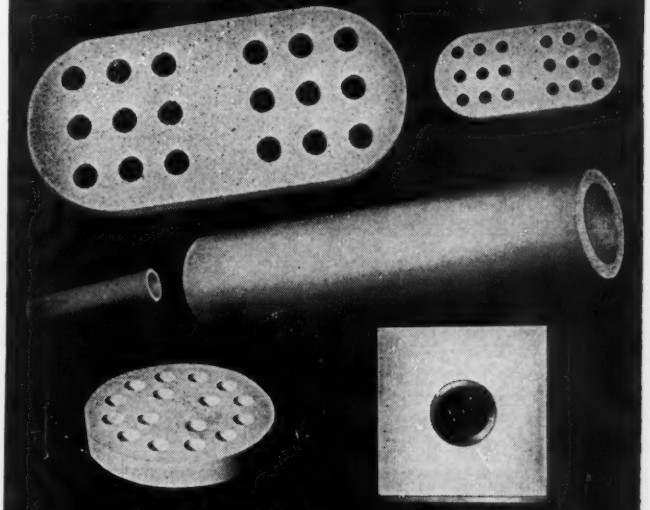

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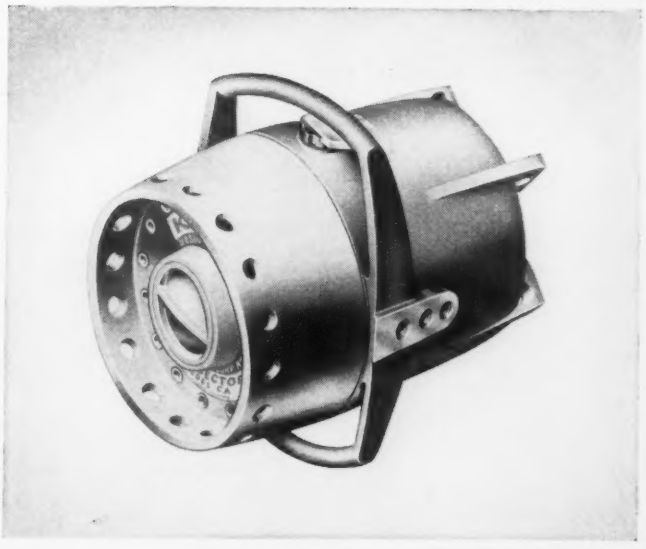
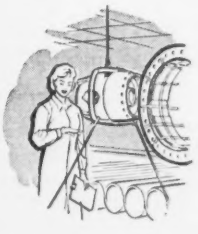
The KEL-RAY® Projector
a portable tool for low-cost radiography



Here is a new development employing radioactive cobalt, iridium, or cesium as a source of gamma rays. One of the most practical means yet devised for industrial non-destructive testing, the KEL-RAY Projector lowers costs and simplifies procedures wherever radiographic testing can be applied. Here's why:

PORTABLE—Requiring no external power, the KEL-RAY Projector is available in three portable sizes, the smallest of which can be moved by hand.



SAFE—Ruggedly constructed, equipped with tamper-proof shutter, it is designed and built to keep radiation leakage at a minimum—well below AEC and ICC safety requirements.

ECONOMICAL—Initial and operating costs are low. Requires no maintenance during life of isotope. Set-up time and man-power are minimized.

EASY TO USE—Simple to operate on light or heavy material up to 8 inches thick by anyone properly trained.

For information on how the KEL-RAY Projector can meet your needs, write for Bulletin P196F.

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WELDING SUPPLIES • RADIOGRAPHIC EQUIPMENT • PLATING MATERIALS • ORGANIC COATINGS
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RESERVE WEIGHT

Assures rapid shakeout on even heaviest castings

The *Foundromatic* shakeout weighs more than 40% of its rated capacity. It's this extra weight that slashes knockout time by providing *vigorous vibration* on *all* loads. Why buy extra capacity? The *Foundromatic* shakeout will give you all the reserve weight you'll ever need for a fast, clean operation.

Sturdy construction cuts maintenance

Free-floating body, including heavy reinforced deck supports and discharge hopper, is a one-piece unit. Entire structure is stress-relieved to provide maximum resistance to shock loads. Heavy flat deck minimizes flask damage. Simplified two-bearing mechanism is not affected by overloads. Oversized bearings afford extra-long, dependable service.

See your A-C representative or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin. Ask for Bulletins 07B6365B and 07B8141.

New Control Eliminates "Stopping Bounce"

This patented control eliminates mechanical snubbing and the excessive maintenance required by friction checks. Control reverses motor torque of driving motor after speed has been reduced. With torque opposing rotation of mechanism, shakeout is brought to stop before stopping amplitude builds up. Smooth stop prevents damage to castings and flasks . . . prolongs life of motor and drive. A-4966

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No. 4 DAYTON RING VALVE BENCH RAMMER

MORE POWER—MORE SPEED

You'll get more production with these faster, more powerful rammers and at the same time substantially reduce maintenance costs.

The Valve Units will last for years. The Cylinder Bores and Piston Rods are HARD CHROME PLATED which doubles the life of the Rammer. Many of the largest foundries in the country have already adopted them as standard. Made in six sizes to meet every requirement.

Send for Bulletin 300

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MODERNIZATION

HIGH SILICA QUARTZITE PEBBLES

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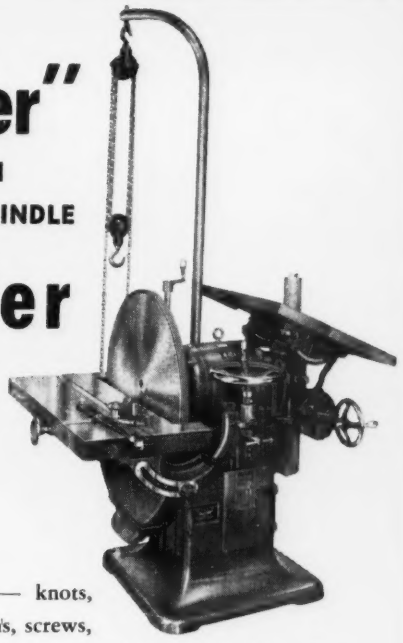
"Oliver"

30-INCH
DISK AND SPINDLE

Sander

for pattern shops



Sands patterns — knots, cross or end grains, screws, nails, etc. Both tables tilt 45°. Disk table adjustable vertically. Takes spindles 2", 3", 4" in diameter, and 9" long. Has accurate duplicating and circle sanding attachments. Also made as Single Disk and Double Disk Sanders. Write for Bulletin No. 34.

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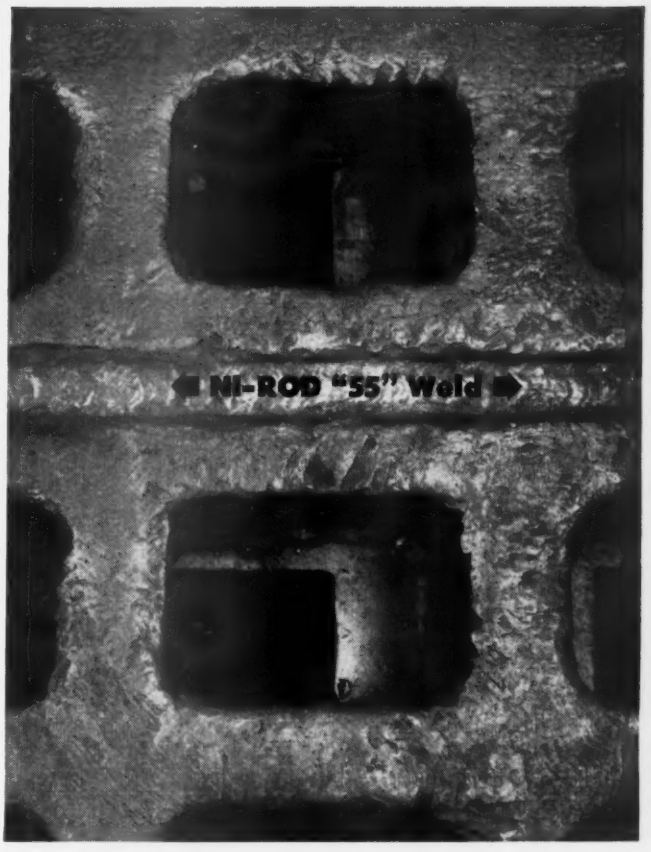
Established 1890 GRAND RAPIDS 2, MICHIGAN



No preheat or postheat was needed to join these two 8300-lb. ductile iron castings of this foundry shake-out grate.

Shake-out grate proves

NI-ROD "55" WELDS DUCTILE IRON SOUNDLY

This ductile cast iron grate has taken more than 10 months of rough treatment in a foundry shake-out. It has been battered by 55-ton castings. But the NI-ROD "55"* welds show no sign of opening up. Not a sign of a crack.

That is proof you get sound ductile welds in alloy cast iron as well as ordinary iron castings with NI-ROD "55" electrodes. And you get other advantages. When you repair defective castings, NI-ROD "55" welds *machine easily*. They match the color of the cast metal closely, too.

Use NI-ROD "55" electrodes to simplify cast iron welding. *(Nine out of ten jobs will need no preheat or postheat!)* Order a 5 lb. trial package from your supplier today.

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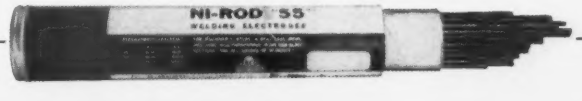
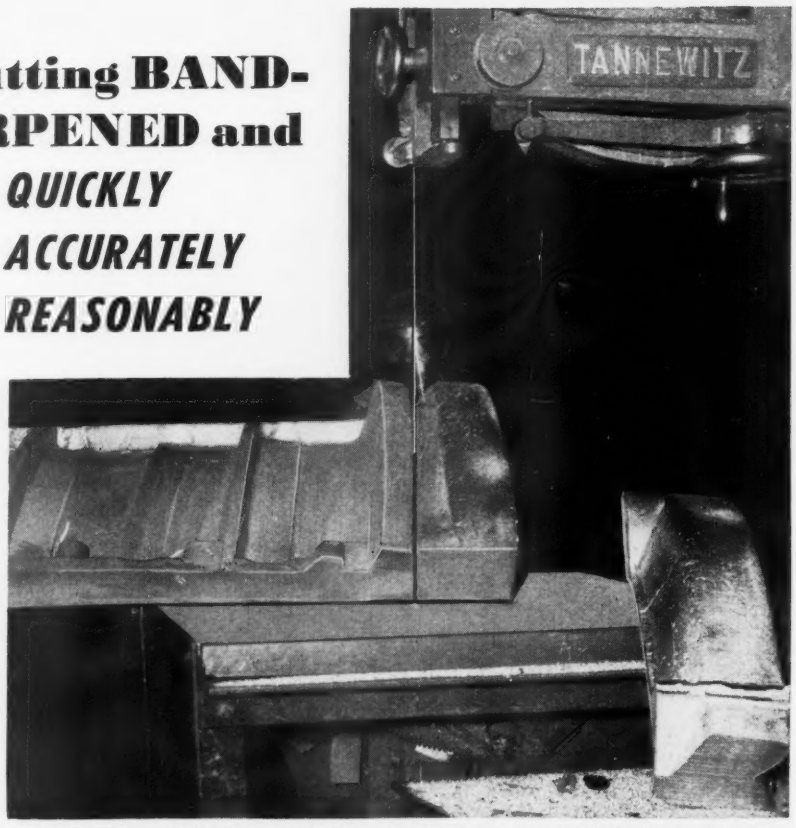


Nonferrous metal-cutting BAND-SAW BLADES SHARPENED and REPAIRED . . . . . *QUICKLY ACCURATELY REASONABLY*



The Lenox blade you see here in a Tannewitz machine is one of our responsibilities. We keep it sharpened and repaired for the Harsch Bronze and Aluminum Foundry, Cleveland, where it gets plenty of hard service. Photo shows it sawing a large riser from a heavy aluminum casting. Jobs like these are rough on bandsaw blades—and that's why our services are so helpful. We keep these blades sharp; we adjust the teeth, check the pitch, and keep life in blades that otherwise are headed for the scrap pile. If you use metalcutting bandsaws, we can save you money by taking care of your blades. Just ask us; we'll show you. Write today:

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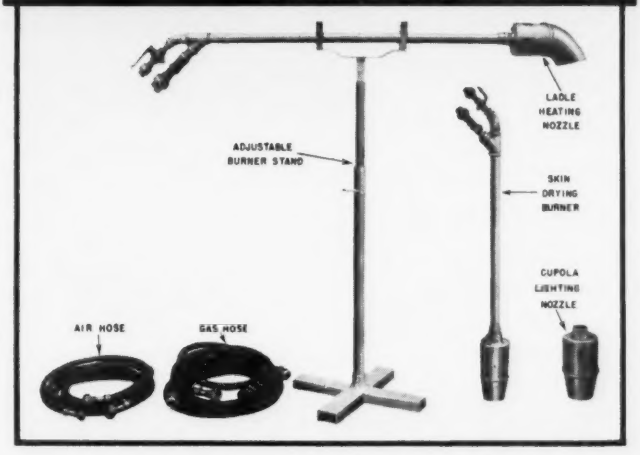

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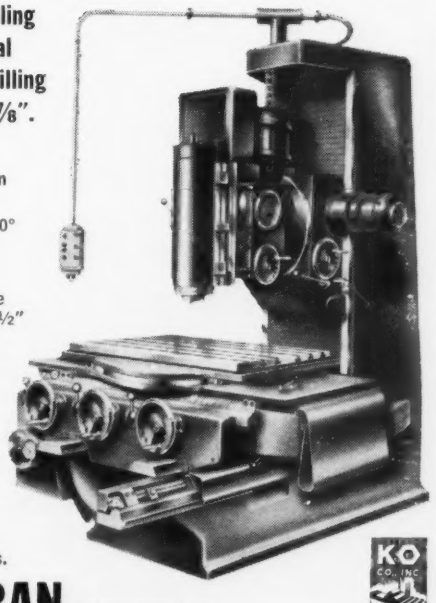
BOKOE No. 3 Universal Miller

For non-ferrous, cast iron and alloy steel tooling, patterns and production to close tolerances.

Use it for radial drilling in addition to vertical milling, universal milling and boring up to 11⅞".



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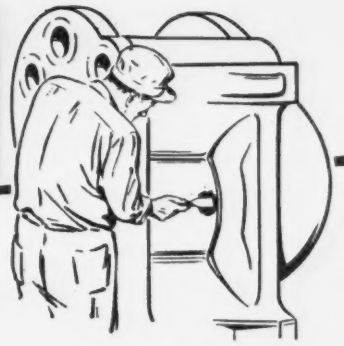

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When correcting blow or sand holes, surface blemishes, or rough and porous areas in castings, you can depend on Smooth-On Foundry Cements, standard of the industry for more than 55 years. They are easy to apply, harden quickly, stay firmly in place.

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Why not try one or more of these Foundry Cements at our expense? We will be glad to send you a free sample of any of the cements described above if you will write us on your business letterhead. Write today, and see how Smooth-On can improve the appearance of your castings.

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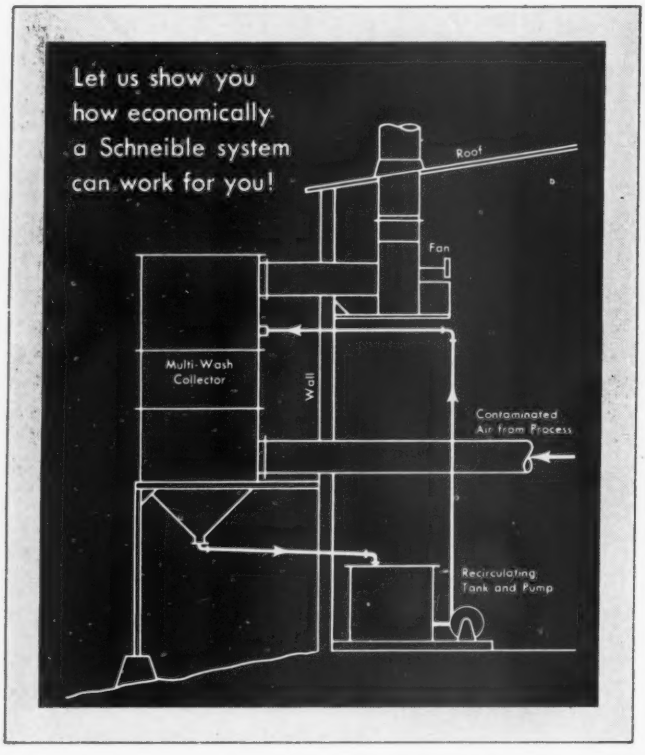
SMOOTH-ON
FOUNDRY CEMENTS

SO-38P

SPECIFY SCHNEIBLE DUST CONTROL

for simplicity and efficiency



Wherever you see a Schneible Dust Control System you'll find an efficient, profitable operation.

Whether it be Cupola Collectors, Hoods for pouring, shakeout, casting cooling, grinding, tumbling or Multi-Wash Collectors in operation on one of its many diversified uses, you can be sure that economy and efficiency was a determining factor in the choice of Schneible Dust Control Equipment.

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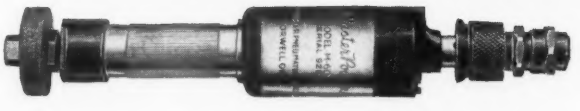

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because they deliver more power per cubic foot of air consumed, are light in weight for easier maneuverability and they retain their new tool power longer.

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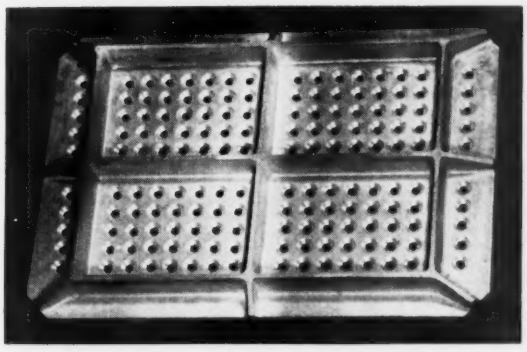

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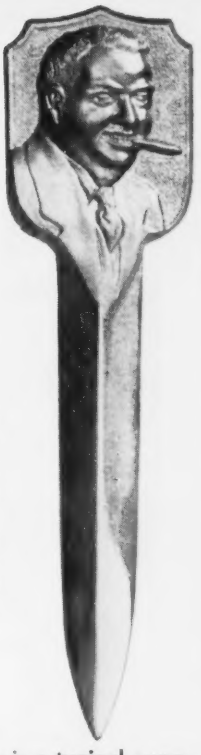
Aluminum
BOTTOM BOARDS
Standard or Special



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No charge for patterns on minimum orders of 50 or more custom boards.

Non-warping and non-burning, our boards assure uniform molds every time. Stacking problems eliminated. Boards not affected by weather.

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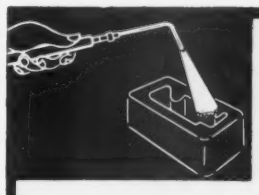

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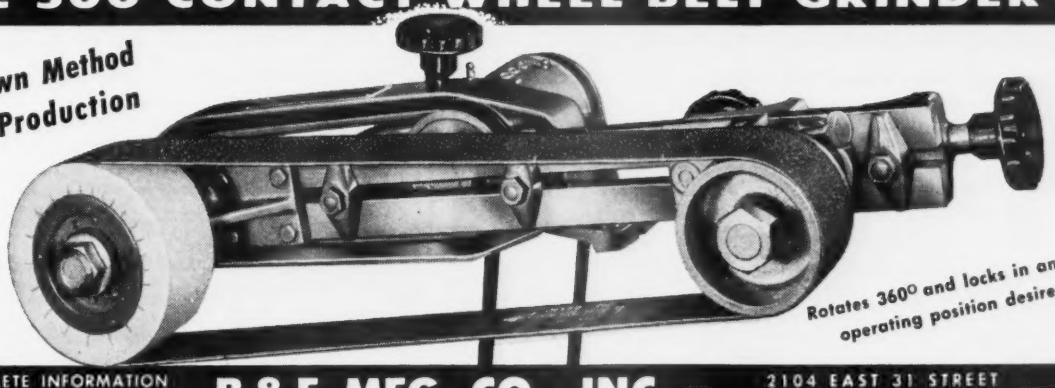

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(Established 1905)

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Tests show that the famous LENOX "Skip-A-Tooth" blades cut faster and last longer. LENOX "Skip-A-Tooth" has a coarse pitch and a round gullet for easy chip clearance.

Which type of blade is best for your cutting operations? Get the answer by writing us. No obligation, of course.

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Please send me complete information on the LENOX Band Saw Blade for cutting Non-ferrous Metals:

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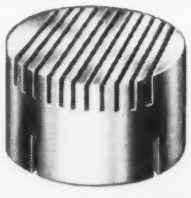

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WHAT DO YOU NEED IN A COST METHOD

The simplest and most complete method of costing ever prepared for nonferrous foundries is found in

BASIC COST PRINCIPLES FOR NON-FERROUS FOUNDRIES

(Non-Ferrous Founders' Society Publication)

Up-to-the-minute guide for costing in both small and large foundries. Prepared by practical foundrymen, based on 10 years of research and experience of the industry under Government Pricing Regulations.

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FOUNDRY RESEARCH METALLURGIST

Experienced in basic electric and Open Hearth practice, carbon and low alloy steels. Position permanent and now open. Give complete information in first letter. Must furnish acceptable references. Information will be held in strict confidence by a single executive.

BOX 813, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

METALLURGIST

A gray iron foundry which is a leader in the field, pouring 175 to 200 tons daily, is seeking a chief metallurgist capable of taking complete charge of a metallurgy department. Laboratory includes a spectograph and other modern metal and sand control equipment. Automatic charging with two cupolas.

Plant is located in a small town offering all the advantages of suburban living. Pleasant home environments, good schools, hunting and fishing, and genuine neighborliness.

Good pay, with liberal benefits, including an outstanding profit-sharing pension plan.

Please provide complete background in first letter, including references, and salary desired.

BRILLION IRON WORKS, INC.
BRILLION, WISCONSIN

FOUNDRY ENGINEER

Medium size gray iron foundry in Northern Ohio needs a man for position as Plant Engineer and General Maintenance Supervisor. He will have charge of layout and installation of all new equipment and overall responsibility for the installation and operation of a maintenance program. Prefer a man between 25 and 35 years of age with some foundry or industrial engineering experience. Reply with full details on past experience and salary required.

BOX 898, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY SUPERINTENDENT

Medium size nonferrous foundry in Detroit area needs thoroughly experienced foundry superintendent to take complete charge. Must have knowledge of all modern foundry techniques and production methods applicable to jobbing and semi-production shop. Experience with cast-to-size techniques helpful. Salary open. Our personnel know of this ad. Send personal description, experience, education, references, salary expected and photograph. Address: Box 885, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY ASSISTANT

Foundry assistant needed by captive gray iron foundry of medium size heavy process machinery manufacturer. Young college engineer graduate preferred. Should have had some foundry experience. Is to help increase plant efficiency, planning, research and operation. Company has liberal profit sharing plan. Salary open. Location S.E. Pennsylvania. Address: Box 843, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLEANING ROOM FOREMAN

Well established steel jobbing foundry in Southwest specializing in medium and lightweight carbon and alloy pressure castings needs: Cleaning room foreman thoroughly experienced in heat teating, welding, cleaning, grinding and inspection. Exceptional opportunities for ambitious man of real ability. Send photograph, complete biography and salary expectations. All replies confidential.

BOX 881, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY SUPERINTENDENT

Want modern, control-minded direction of Midwest Malleable Foundry producing mechanized and semi-production jobbing castings. Must think ahead and participate in modernization program while improving quality and reducing costs. Real opportunity and challenge at adequate salary and bonus. Reply giving personal data and salary requirements.

BOX 866, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

GRAY IRON FOUNDRY SUPERINTENDENT

Well established New England gray iron foundry specializing in job lot production of the highest quality machine tool castings, is seeking a foundry superintendent. Applicant must have a sound knowledge of foundry practice and at least ten to fifteen years' experience in medium and heavy casting work. Practical experience in coremaking, molding, melting and cleaning is necessary. Some technical training is highly desirable. Replies confidential. Send fully detailed resume giving experience, training and salary requirements. Address: Box 907, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGIST OR ENGINEER

With experience in induction furnace operation melting aluminum. Must be capable of supervising production operation in special casting process. Excellent opportunity for growth with fast expanding company. Location Midwest. Submit full resume of education and experience and salary requirements. Address: Box 892, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY FOREMAN

Wanted for medium and heavy nonferrous jobbing foundry located near Detroit. Must have background in all phases of foundry operation, including core room, sand and permanent molds and melting. Top wages and opportunity to advance. Address: Box 879, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLEANING ROOM FOREMAN

Most modern and progressive steel foundry in the middle west. Advise full particulars. Address: SWEDISH CRUCIBLE STEEL CO., 8561 BUTLER AVE., DETROIT 11, MICHIGAN.

Help Wanted

FOUNDRY ENGINEER

A graduate mechanical engineer to do foundry research, experimental work, pattern design and plant layout assignments. A wonderful opportunity for the young engineer who is desirous of bringing up his family in the wholesome environment of a small town with its friendliness, pleasant surroundings and its proximity to the great out-of-doors.

A gray iron foundry which is a leader in its field, and which offers better than average pay and benefits.

Please list complete background in first letter, including salary desired and references.

BRILLION IRON WORKS, INC.
BRILLION, WISCONSIN

BIG OPPORTUNITY FOR MEN WITH NONFERROUS CASTING EXPERIENCE

One of Michigan's largest foundries—located in a city of 100,000 only a few miles from the midwest's greatest fishing, hunting, boating and vacation areas—is starting a research and development program in nonferrous castings. Mechanical, electrical, metallurgical and industrial engineers or technically experienced men in nonferrous production have the chance for rapid advancement in research, project, process, product or maintenance engineering. Excellent salaries, many security and extra benefits and a pleasant life for you and your family in a prosperous, stable, largely home owned, medium size city. Write resume of qualifications to:

BOX 882, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

DESIGNERS-DRAFTSMEN-ENGINEERS

Experienced in foundry layouts and equipment. Age 30-45. Send experience record, personal data, recent photo and references.

BOX 865, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

METALLURGIST

For malleable iron foundry in East, to work into complete control of product from melting through annealing. Knowledge of pearlitic malleable would be helpful. Should appeal to man who wants to be his own boss. This is a small organization. Please give full particulars regarding background and salary desired in first letter. Address: Box 847, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ALUMINUM MELTING SUPERINTENDENT

Position with industrial organization developing new and unusual metal processes. Graduate metallurgist preferred. Necessary to have knowledge of furnace construction and operation. Experience in alloying, knowledge of principles of pyrometry and heat treating aluminum alloys required. Ideal Southern California community with outstanding environmental features. Address: Box 902, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY ENGINEER

Challenging position in management engineering for young foundry engineer prepared to travel. Must know gray iron foundry operations, able to make layout drawings. Industrial engineering experience desirable. Reply with photo and state age and salary required. Address: Box 808, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOREMAN

Northern Ohio foundry requires experienced gray iron foreman. Reply should include age, education, experience, salary requirement and recent photo. Address: Box 884, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

Help Wanted

WANTED

Large steel foundry organization interested in men in thirties and early forties, preferably with pattern background and wide experience in developing and checking molding and core practices. Write stating full particulars to:

BOX 878, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

CHEMIST

Analytic chemist for malleable iron foundry laboratory. Knowledge of metallurgy desirable, but not mandatory. Well equipped laboratory located in Western Pennsylvania.

Write giving full information, personal and education background, and salary expected.

BOX 890, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

WANTED

Foundryman for sales work. Must be capable in cupola operation, maintenance and sand control. Travel Midwest.

BOX 888, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

METALLURGIST

For well established foundry, making malleable iron and pearlitic malleable, located in Western Pennsylvania, to be in charge of melting and a well equipped laboratory, analytical, physical and photographic. Give personal and educational data, resume of experience, and salary desired.

BOX 891, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SALES ENGINEER

Established midwestern jobbing steel foundry. Sales and estimating experience required. Write full qualifications and required salary to:

BOX 887, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

METALLURGIST

Technically trained with malleable experience for well established progressive, jobbing and semi-production foundry in middlewest employing 150 men. Capable of supervising batch type air furnace melting, annealing and laboratories. Submit application including personal data, resume of qualifications and experience, references and salary expected. Address: Box 905, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

FOUNDRY TECHNICIAN

Aggressive technically trained foundryman, want position with foundry in need of technical "know-how". Presently employed in modern semi-production gray iron foundry as Director of Quality Control. Desire advancement to management or related field. Strong in metallurgy, sand control, gating and risering, scrap control; know modern molding and core methods; familiar with Ductile Iron, shell molding, heat treating. Degree in Metallurgy and eight productive years' foundry experience. Age 41. Address: Box 889, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT FOREMAN

Desire position in gray iron or nonferrous, jobbing or production. Well versed in all phases of foundry operation. Practical and Technical. Fifteen years in supervisory positions, available immediately. Address: Box 863, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES ENGINEER AVAILABLE

Now covering Chicago and 200 mile radius. Fifteen years' experience in ferrous and nonferrous castings, including product development and supervisory experience. Desire salary and expenses. Address: Box 871, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

EXPERIENCED PRACTICAL FOUNDRYMAN

Desires position in nonferrous, brass and aluminum jobbing and production shop. Very well versed in all phases of foundry operations. Journeyman molder by trade, 20 years' experience in aluminum and brass jobbing and production. Knowledge of melting, core work, machine and loose pattern. Knowledge of alloys, special gating techniques and problems. Am 37 years old and at present employed as superintendent of nonferrous jobbing and production shop. Would like to locate on West Coast. Address: Box 868, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Thorough knowledge of all phases of nonferrous metals. Understand gating, jobbing, floor, machine and plumbers supplies. Can also produce pressure tight and porous free castings. Know sand control and core room work. Address: Box 854, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

EXECUTIVE

Experience in all phases of foundry operations and management. Thorough knowledge of machine shop, pattern shop, engineering, metallurgy, foundry cost and estimating, sales and industrial relations. Registered mechanical engineer, 25 years' experience foreman, superintendent, general manager and vice president. Foundry running 150 tons daily. Address: Box 904, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

YOUNG FOUNDRY ENGINEER

With B.S. degree in I. E. and Foundry Option being separated from Army soon. Have had training program and experience in maintenance and production in large gray iron foundry. Interested in managerial position with a small gray iron foundry. Address: Box 896, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MELTER

Young ambitious man. Ten years' practical foundry experience. Six years' experience as melter—two years of this time as head supervisor in melting operations. Address: Box 850, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

EXPERIENCED PRACTICAL FOUNDRYMAN

On both iron, steel and manganese steel. Have been general foreman, superintendent and consultant. Married and 56 years old. Best of references. Address: Box 853, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CORE ROOM FOREMAN OR ASSISTANT

High school graduate, 35 years of age, 16 years' experience in medium and heavy jobbing foundries, iron and steel. Have worked 13 years as a coremaker and 3 years as core room foreman. Desire a job to get further training as a supervisor or assistant. Address: Box 886, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

INDUSTRIAL ENGINEER

Four and a half years' mechanized gray iron foundry experience. Acquainted with all phases of foundry operation. Can reduce costs and increase production. Married, age: 30. Resume on request. Address: Box 893, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PATTERN SHOP FOREMAN AND CASTING BUYER

Desire position either as pattern foreman and estimator or as pattern engineer and casting buyer. Like to travel, prefer position in West or far Midwest. Address: Box 876, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY EXECUTIVE AND METALLURGICAL ENGINEER

Presently managing gray iron foundry seeking new affiliation with progressive gray iron or malleable foundry or sales organization. Experience in management, technical, sales and operational phases of gray iron and malleable. Age 34. Address: Box 899, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED

Position as buyer of pattern equipment and castings with consumer concern. Age, mid-thirties, married and desire to relocate. Sixteen years' experience with foundry industry and consumer use. Address: Box 877, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MASTER MECHANIC

Experienced maintenance and machine shop, desire employment. Fourteen years' supervisory experience, technical training. Address: Box 903, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

WORKS MANAGER-SUPERINTENDENT

Capable of operating a 350 man organization, 23 years of experience in casting ferrous and nonferrous metals in sand, permanent and investment molds profitably. Address: Box 849, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GENERAL FOUNDRY FOREMAN

Seventeen years' foundry supervision experience, capable of handling small or large forces. Cost conscious, high production rate in either iron, brass or steel. Will relocate. Address: Box 883, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GRAY IRON SUPERINTENDENT

Age 40, seeking location in Milwaukee or midwest area, 22 years' experience. All phases. Address: Box 906, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

INDUSTRIAL ENGINEER

Several years' experience in Standards and Methods, well qualified to reduce cost and increase production. Also will assist management in all problems. Address: Box 901, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundry Consultants

ELECTRIC FURNACE CONSULTANT
BASIC AND ACID PRACTICE

Supervisor on electric furnaces for 35 years. Thorough knowledge of:

1. All kinds of plain carbon and alloy steel.
2. Analysis control.
3. High standard of physical properties.
4. Low Cost with high productivity.

EUGENE H. WEAK 2933 HIGHWAY AVE.
HIGHLAND, IND. PHONE: TEMPLE 8-1244

HAROLD J. ROAST, FIM, FCS

BRONZE FOUNDRY CONSULTANT
50 YEARS' EXPERIENCE
AVAILABLE COAST TO COAST

140 GROSVENOR AVENUE
OTTAWA, ONTARIO, CANADA

CONSULTANT

Specializing in quality control by installing the correct techniques for **CENTRIFUGAL CASTING, PERMANENT MOLDING** and sand molding of brass and bronze castings. Address: LEIGHTON M. LONG, TONTOGANY, OHIO, PHONE: TONTOGANY 3065.

Capacity Wanted

WANTED GRAY IRON CASTINGS

Volume user of small castings seeks contact with foundry capable of giving prompt service. Reply should contain information concerning machining capacity and ability. Address: Box 861, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Opportunity

PERMANENT MOLD METHOD AVAILABLE

THE WAGNER PERMANENT MOLD CO., 2910 Empire Ave., Burbank, California, has developed a Permanent Mold Method for ferrous and nonferrous metals and invites inquiries from any country regarding this method and process.

Employment Service

FOUNDRY PERSONNEL SPECIALISTS

National Placement and Procurement of

GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS.

Confidential Inquiries Invited

From Employers and Qualified Applicants.

For Fast Competent Assistance Contact

DRAKE PERSONNEL, INC. **HARRISON 7-8600**

JOHN COPE, DIRECTOR **220 SOUTH STATE ST., CHICAGO, ILL.**

SALARIED PERSONNEL

$5000-$30,000. This reliable service, established 1927, conducts confidential negotiations for high grade men who seek a change of connection under conditions assuring if employed full protection to present position. Send name and address only for details. Personal consultation invited. Address: JIRA THAYER JENNINGS, P. O. BOX 674, MANCHESTER, VERMONT.

Representatives Wanted

SALES OPPORTUNITY

(SOUTH and SOUTHWEST)

Prominent, midwestern manufacturer of foundry supplies and equipment is planning to expand sales in Southern and Southwestern States. Openings available for five aggressive, sales-engineering representatives, on salary and bonus arrangement. Foundry experience necessary. Reply should include age, education, selling and foundry experience, recent photo.

BOX 897, FOUNDRY

PENTON BLDG. **CLEVELAND 13, OHIO**

DISTRIBUTORS OR SALES REPRESENTATIVES

Manufacturer expanding sales effort into all Foundry centers in U. S. and Canada. We seek aggressive and experienced sales organization to contact prospects and introduce our long established nationally advertised line of products to all foundries and all patternshops in your area. Many leads provided from direct mail campaigns. Excellent pofit and repeat business. Producer will assist in expanding established market. Please give detailed information on territory covered, number of salesmen, warehouse facilities, if any, and other lines handled in first letter. Address: Box 880, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES REPRESENTATIVES

Through our advertising in FOUNDRY and other trade magazines, we are receiving inquiries for our strainer cores, pouring pipes and other ceramic specialties. We require experienced sales representatives to contact these interested prospects and introduce our line of products to all foundries in several good territories. Please give detailed information about yourself and other lines handled in first letter. Address: MR. C. L. EVANS, UNIVERSAL CLAY PRODUCTS CO., SANDUSKY, OHIO.

COMMISSION MANUFACTURERS' REPRESENTATIVE

A medium sized open hearth steel foundry seeks representation in Baltimore, Philadelphia, York and Harrisburg, Pa. area. One calling on machinery manufacturers and fabricators and known users of steel castings preferred. Straight commission. Address: Box 910, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Representatives Wanted

SALES REPRESENTATIVE

Medium sized open hearth steel foundry offers excellent opportunity to aggressive salesman. Territory would be Eastern part of New York State, New Jersey, Eastern Pennsylvania and Maryland. Send full qualifications and salary requirements in first letter. Address: Box 908, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

COMMISSION MANUFACTURERS' REPRESENTATIVE

A medium sized open hearth steel foundry seeks representation in the New York, New Jersey area. One calling on machinery manufacturers and fabricators and known users of steel castings preferred. Straight commission. Address: Box 909, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Wanted-To-Buy

WANTED TO BUY

Sterling Type Flask

19" x 21" with 12" cope and 12" drag
24" x 28" with 12" cope and 12" drag
36" x 36" with 15" cope and 8" drag
42" x 42" with 15" cope and 8" drag
48" x 48" with 18" cope and 10" drag
26" x 42" with 11" cope and 10" drag

or sizes reasonably close

1—Molding machine J & J #1020 RC, Jolt rollover pattern draw with turn table (or similar)
1—Molding machine J & J #1020 RC rollover pattern draw with turn table (or similar)

BOX 832, FOUNDRY

PENTON BLDG. **CLEVELAND 13, OHIO**

WANTED TO BUY

1—Good used tumbling barrel about 36" diameter x 60" to 72" long. Will also consider square unit of same approximate dimensions.
200—Good used aluminum or magnesium bottom boards for use with 13" x 18" slip flasks.
1—Good used hydraulic lift truck, 2 ton capacity.

BOX 911, FOUNDRY

PENTON BLDG. **CLEVELAND 13, OHIO**

WANTED TO BUY

Southern Foundry wants to purchase for cash following used equipment in good condition.
1—10,500 CFM 20 ounce cupola blower 85 HP, 440 volt, totally enclosed motor.
1—14,100 CFM 2½ # cupola blower with 200 HP, 440 volt, totally enclosed motor.
2—No. 3 UD or No. 3 F Simpson Mixers.
In reply state price, location, guarantee, condition and age of equipment.

BOX 875, FOUNDRY

PENTON BLDG. **CLEVELAND 13, OHIO**

WANTED TO BUY

Muller, up to 600 lb. batch; American 27 x 36 shot blast or equivalent; 5 to 10 H.P. air compressor; centrifugal blower, approximately 1500 cfm at 16 oz.; two No. 1 Redford core blowers; Small cut-off wheel.

WAYNE EDWARDS
R.R. 2, BOX 287
LANSING, MICHIGAN

WANTED TO BUY

BEARDSLEY & PIPER MIXER—Size No. 30. Speed Muller. In reply state price, condition and location. Address: Box 900, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Wanted-To-Buy

WANTED

Electric melting furnace, 1 to 3 tons per hour, prefer Heroult or Lectromelt but will consider others.

Write or call:

KEDDY MACHINE COMPANY
MIDDLETON, MASS.
TELEPHONE: Danvers 2000

WANTED

Simpson Sand Mixer 1000-1600# capacity. Give price, condition and location.

STANLEY FOUNDRIES
6009 SANTA FE AVENUE
HUNTINGTON PARK, CALIFORNIA

WANTED TO BUY

Reda Melting Furnace

State size, condition, oil or gas-fired

BOX 894, FOUNDRY

PENTON BLDG., CLEVELAND 13, OHIO

WANTED

3 Phase Direct Arc Furnace, rated ¾ to 1 Ton capacity, complete with all parts other than transformer and controls associated with transformer room. Top charge of no interest.

BOX 855, FOUNDRY

PENTON BLDG. **CLEVELAND 13, OHIO**

WANTED TO BUY

Used "Moulders' Friend" sand conditioner, 50" brush length, 70" overall length. Address: PEQUONNOCK FOUNDRY, INC., BRIDGEPORT, CONN.

WANTED

Match plate or original patterns for unusual decorative accessories. Will pay cash. Address: VIRGINIA METALCRAFTERS, WAYNESBORO VIRGINIA.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price or immediate acceptance. Address: Box 578, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED TO BUY

One-quarter or one-half ton acid electric furnace. Address: Box 844, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundries For Sale

FOUNDRY

For Lease or Sale

Ferrous or Nonferrous

30 Inch Cupola, Overhead Crane

Miscellaneous Equipment

Railway Siding

Experienced Labor Market

Contact:

GROSS-FEIBEL COMPANY

HILLSBORO, OHIO

FOUNDRY FOR SALE

Brass foundry and machine shop, manufacturing marine hardware, propellers and fire fighting equipment in Vancouver, Canada. Good opportunity of securing a going business. Address: Box 831, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

For Sale

MOVING TO NEW AND LARGER QUARTERS
NO REASONABLE OFFER REFUSED ON THE FOLLOWING BEFORE MOVING:

Jolt Squeeze Strip Molding Machines
720 PJ Osborn 31 x 44 table, 20" squeeze cylinder.
#724 PJ Osborn; 38" x 56" table; 24" squeeze cylinder; 11" jolt cylinder; 10" draw with hopper; 9" squeeze stroke; 4000 lb. cap. new in 1948; excellent condition; extra large size.
#163 Milwaukee—Table size 16" x 28"; actual capacity 16" x 44"; frame lift type; 1500 lb. capacity; also #143 and #183 Milwaukees.
Nicholls—Type B; 1945 machine; 14" cylinder; 14" x 36" table.
211 SPO.
213 SPO 19 x 26 table, 4½ jolt cylinder, 13" squeeze.
2114 SPO 14 x 24 table, 11" squeeze cylinder.

Jolt Stripper Molding Machines
559 Osborn 25 x 30 table, 1200 lb. jolt capacity.

Jolt Rollover Molding Machines
#918 Johnston & Jennings—44" x 54"; 18" draw; no pit required.
International—Type F; Table size 31" x 12".
Osborn Power Rollovers—Model 2047-4; Cap. 18" x 24"; stationary; 1942 machines.
Osborn #601; 750 lb. jolt capacity; 30" overall flask length.
Osborn #602; 750 lb. jolt capacity; 36" overall flask length.
Osborn #605; 750 lb. jolt capacity; 54" overall flask length.
SPO—Model #914; 14" cylinder; 30" capacity.
Tabor 30" x 40", extends to 69", 12" draw, shockless type, 1500 lb. cap.

Jolt Squeezers
Nicholls Type D Jolt Squeezer.
Osborn #275 J Jolt Squeezers; table size 16" x 20"; 10" squeeze cylinder diameter.
Osborn #276 jolt squeezers.

Push Off Machines
Champion Push off machine; Model LLA-45; table size 45" x 26"; used with sand slinger.
International Push off machine; Model LP—Portable pin lift; used with sandslinger.

Core Blowers — Core Rollovers — Core Draw Machines
#193 Osborn — for medium sized cores; equipped with air operated draw pistons.
#94 Osborn—for large cores.
Osborn Hand Rollovers—Model 42; table size 14" x 20½"; maximum width of Core Box —22".

Material Handling Equipment
Model HA Hough Payloaders—Rebuilt.
Clark Fork Lift Trucks—6000 lb. Capacity.
Lewis-Shepard Platform Lifts—6000 lb. capacity.
Baker Raulang Fork Lift Truck—6000 lb. with ready power unit.
Elwell Parker Fork Lift Truck—6000 lb. with ready power unit.
Yale Fork Lift Truck—6000 lb. with ready power unit.
Mercury Fork Lift Truck—2000 lb.—Electric.

Furnaces
Stroman 2000 lb. Tilting Hydraulic; New in 1944.

Core Ovens
Dielectric—Model 900A and 1800A.

Miscellaneous Foundry Equipment
U. S. 7½ HP 3 speed grinders; 28" wheel.
U.S. adjustable speed grinder, Model 64, 20" x 2" x 3".
Ingersoll-Rand pneumatic hoist with trolley, size "C."
Beardsley & Piper Sand Slinger, 19" head, 4" cup, 4' ramming arm.
#50 Beardsley & Piper Speedmuller.
Model S Beardsley & Piper Screenerators.
Royer Screenerator.

FOR THE BEST DEAL CALL
BALCHER MACHINERY COMPANY
6020 EUCLID AVENUE
CLEVELAND 3, OHIO
TELEPHONE: EXPRESS 1-8930

FOR SALE

Detrex Degreaser, Model US800-S, Size 84-36-36 with 2 baskets. Purchased Jan. 1955. Like new.
Three Osborn Drag Molding Machines, type 332-49.
Link-Belt Mold Conveyor, including drive and 98 cars size 24" x 60".

ALBION MALLEABLE IRON COMPANY
ALBION, MICHIGAN

FURNACES FOR SALE

Ten used heat treating furnaces and two 7-ton gantry cranes. Good condition, priced to sell. Address: BAER STEEL PRODUCTS, INC., BOX 1428, BOISE, IDAHO.

For Sale

FOR SALE

MOLDING MACHINES
1—Herman, Jolt, Rollover Draw, 6000#, 40" x 60" table.
2—International, Jolt, Rollover Draw, 24" x 10G, Stationary.
2—International, Jolt, Rollover Draw, 20" x 8-G. Portable.
2—No. 275 Osborn jolt squeezers. Stationary.

CORE OVENS
1—Coleman Recirculating 3 section with 5 drawers per section. Gas fired.
1—Coleman Recirculating 4 section with 5 drawers per section. Gas fired.

BLOWERS FOR CUPOLAS AND FURNACES
1—Connersville Rotary Blower, 3500 CFM.
2—#7½ Roots rotary blowers—27 x 81—14000 CFM.
2—Connersville Rotary 14" x 27" HD, 2750 CFM at 5# press.
1—Connersville rotary blower 22 x 66 45 cu ft per revolution 9000 CFM.
Maxon-Premix Blowers for Gas ¼ to 1 HP.
2—2 HP 20-oz. Spencer Turbine Blowers.
2—Spencer Turbine Blowers, 3000 CFM, 24 oz., 30 HP, 3/60/220-440 V.

METAL MELTING EQUIPMENT
1—1000# open flame brass melting furnace, gas fired.
1—Hausfeld Stationary Brass, oil or gas burner, 200# cap.
1—Hausfeld Tilting crucible, gas, 250# Al, Cap.
1—Hausfeld 2000# aluminum capacity furnace, barrel type, open flame, oil fired.

MISCELLANEOUS
1—Curtis 2 cyl. 25 h.p. compressor unit.
1—Beardsley & Piper Model S Screenerator.
1—Pangborn 1 to 4 nozzle air blast generator, complete.
1—Sullivan, 2 stage compressor, 14-8¾ x 10, 75 HP.
1—Sly Tumbler 24" x 40".
1—International SB-11 core blower.
2—Pangborn cloth screen collectors, 2 HP.
1—Stoney crane type shakeout.
1—NPD Royer sand separator.
1—#16 Roto-clone unit complete.
Complete stock of rebuilt mill and dust exhaust blowers.

CLIFTON MACHINERY COMPANY
1023 W. SIXTH ST. CINCINNATI 3, OHIO

FOUNDRY EQUIPMENT

16—Pot-type Aluminum Holding Furnaces, 600 Cap. Shell 48" dia. x 35⅜" Hi. with McKee burners and "Wheelco" Capacitrol No. 241 temperature control and indicator, 0-1600° F.
Grinder, pedestal type, dbl. end 12" wheel, model 102 Cincinnati w/2 hp motor less stand, serial No. 75055.
Furnace, heat treat elec. vert. type, temp. 1000°, Young Bros.
12 ft. lift, 120 KW max. load 1000#.
Dust Collector, cloth bag type, Parsons 33'4" x 8'8" w x 21'6" high.
Dwg. A-5619-1A-4680 Sq. Ft. filtering area w/ motors.
Dust Collector, wet type 500 CFM "Uni-Wash"
Spencer-Turbo Compressor blower 550 CFM 20 oz., 220 volt motor, 3 hp.
Spencer-Turbo Compressor blower 150 CFM 24 oz., 220 volt, 2 hp motor.
Spencer-Turbo Compressor blower 85 CFM 20 oz. lot 15802, 220 volt, serial No. 18017.

BOHN ALUMINUM & BRASS CORP.
1400 LAFAYETTE BLDG.
DETROIT, MICH.

FOR SALE

Structural steel foundry buildings, connected for approximately 170 ft. width x 300 ft. length, open both ends, together with a three ton top charge Lectromelt arc melting furnace, electrical equipment, ladles, charging buckets, miscellaneous repair parts and accessories.

FOR FURTHER INFORMATION, CONTACT:

MR. A. D. HOWARD
SALVAGE SALES DEPT.
HUGHES TOOL COMPANY
HOUSTON, TEXAS

For Sale

FOR SALE

Going out of business sale of equipment, supplies, house and buildings situated on farm in Upstate, New York. No reasonable offer refused. Send for complete detailed listing. Will sell all or part.
1—2" x 3" Cleveland flask rapper
1—4 wheel hydraulic lift truck with 4 core racks
1—Double compartment gas fired core oven
1—1000 lb. 2-#200 Campbell-Hausfeld Tilting furnaces
2—#60 stationary Campbell-Hausfeld Furnaces all complete with blowers
600—assorted steel core plates
200—assorted aluminum core plates
6—Tabor jolt squeezers
3—Osborn jolt squeezers
1—International jolt squeeze stripper
3—Hand rollovers
6—Flexible shaft machines
1—Jackson & Church impregnator
1—5 H.P. and 1-10 H.P. air compressor
1—Abbott 2 comp. tumbling barrel
3—Grinders
2—Royers
25—Various sizes Hines pop-off flasks and jackets
200—Various sizes steel flasks mostly 12 x 18
5—3 H.P. D.C. exhaust fans
1—16" band saw, 1-18" band saw, 1-28" band saw
Large lot of supplies and instruments I.E. Potentiometers pyrometric equipment, etc.
Buildings include 9 room remodeled house, new 40 x 100 cinder block building, 20 x 50 Quonset, 238 acre farm, etc.

CALL, WIRE OR WRITE
UPSTATE METAL CASTINGS, INC.
R.D. 2
NORWICH, NEW YORK
PHONE: NORWICH 4-2824

SAND BLASTING EQUIPMENT

We Buy, Sell and Trade
What-Do-You-Want—We-Will-Find-It-For-You

15 x 20	Wheelabrator with dust collector	$1600.00
27 x 36	Wheelabrator, rubber belt	3000.00
36 x 42	Wheelabrator, steel belt	3500.00
42 x 48	Wheelabrator, steel belt	3500.00
48 x 48	Wheelabrator, steel belt	4500.00
15 Inch	Continuous Wheelabrator	3000.00
6 ft.	Wheelabrator, flat top	2500.00
9 ft.	Pangborn L.F. Table (one side throw wheel)	4000.00
9 ft.	Pangborn L.F. Table (two side throw wheel)	5000.00
6 ft.	Pangborn L.G. Table, 6 aux. tables	2500.00
1½ cu. ft.	Pangborn air blast barrel	350.00
ES-421	Pangborn shell blasting machine	3500.00

Tumbling Barrels, horizontal and vertical.
Hand Blast Cabinets—Pangborn, American and Ruemelin.
Dust collectors all sizes from 100 CFM to 5000 CFM.
New wear parts for Pangborn Motor Block conveyor type blasting machine.
Dust collector, Pangborn CK 220, 2000 CFM.

DIAMOND SAND-BLAST, INC.
5654 WEST JEFFERSON
DETROIT 9, MICHIGAN
PHONE: VINEWOOD 3-6751

WASHERS & DEGREASERS
FOR SALE, RENT OR LEASE

International 3 Stage Monorail, 30"w x 27"h x 31'l Late
Ransohoff 3 Stage Monorail, 20"w x 34"h x 28'l Late
Ball Washer 3 Stage Monorail, return type GF 20"w x 24"h
Howard Washer 3 Stage Mesh Belt, 20"w x 18"h x 20'l
MANY OTHER SIZES AND TYPES TO CHOOSE FROM.

Please call "COLLECT" TOwnsend 8-8450
METAL TREATING EQUIPMENT EXCHANGE
9825 GREELEY
DETROIT 11, MICHIGAN

FOR SALE

Completely overhauled Roots-Connersville Blower, 3200 CFM; max capacity. Will sell for $1000.00 —F.O.B. Alpena, Michigan. Price does not include motor. Address: THUNDER BAY MFG. CORPORATION, P. O. BOX 317, ALPENA, MICHIGAN.

FOR SALE
SURPLUS FOUNDRY AND SHELL MOLDING EQUIPMENT

	Each
1—Obermayer Economy Core Pasting Machine (Mechanical)	$ 45.00
1—Yale & Towne Midget King 1 Ton Electric Chain Hoist	95.00
2—Osborn #275-J Jolt Squeeze Molding Machines Portable	225.00
3—Osborn #257-J Jolt Squeeze Molding Machines Stationary ..	200.00
2—Bridgeport Floor Type Double End Ball Bearing Grinding Stands for 18" x 3" Wheels, Pulley Drive	200.00
1—Chapman Ball Bearing 10 h.p. motor, 25 cycle, Swing Frame Grinder	300.00
1—Marschke Type KXA Floor Type Double End, 3 Speed Grinder, Belt Drive in Base, 15 h.p. motor, 25 cycle, 18" x 3" Wheels	425.00
1—Ferracute PG 3 Punch Press 4" Stroke 7" Throat Depth 23" x 12" Bed	595.00
1—36" Dia. x 7' High Double Riveted Steel Air Receiver	105.00
1—Specimen Polisher 3-6" Heads, Friction Drive Cast Iron and Steel Floor Base	120.00
2—Leeds & Northrup Micromax Recording Pyrometers 200° to 2000° F.	350.00
1—Leeds & Northrup Portable Potentiometer Range 0° to 2000° F. Chromel-Alumel	135.00
1—G.E. G.T. Magnetic Comparator and Lead with 1 pair test coils, 60 cy. 115 V	300.00
2—Chisholm-Moore 2 Ton Aluminum Housing Hand Hoists 9' lift, 6' long extension on Hand Wheel Shaft. Excellent for handling bull Ladles	200.00
1—Wm. Ainsworth Model LC Balance with 3" Balanced Watch Glasses	95.00
1—Connersville #20 B Rotary Blower, Pulley Drive, including base and pulley	25.00
1—1000# Wrecking Ball with Snatch Release Hook	100.00
1—Cyclone Dust Collector 8' Dia x 4' High Body Top Collar and Lower Cone	125.00
1—40' Bucket Elevator for Unloading Sand, etc. direct from Car. Excellent Mechanical Condition. Shell needs some repairs	1900.00
1—9 x 8 Ingersoll Rand ER 1 Air Compressor and Air Receiver, 25 cycle, 30 h.p. motor	475.00

SHELL MOLDING EQUIPMENT

1—Sutter Products Co. 20" x 30" Plate Automatic Shell Molding Machine Complete	8500.00
1—Great Western Combs Type "V" 20" Dia Gyrating Riddle	90.00
1—Illinois Testing Laboratories Alnor Type 4000 Pyrocon Contact Pyrometer with case and Thermocouple	75.00
1—Great Western Combs Laboratory Gyratory Sifter and 11 pans with screens 6 to 270 Mesh....	135.00
2—Hoskins Type FR 252 Experimental Electric Annealing Ovens 2000° F. Maximum, Hearth 20" x 16" x 30" deep	300.00
1—Redford Core Blower Bench Type with air clamp—#1	325.00
1—Redford Core Blower complete with Air Clamp—#2	550.00
1—Spencer Turbo 24 oz. Blower direct connected 5 h.p. 60 cycle motor	190.00
1—Pangborn GJL Rotoblast shot barrel 52" dia x 40" Rubber lined including loading bucket..	1600.00
1—41" Rotary Table Gas Fired Adjustable Speed Shell Core Oven with 14 Selas Burners. Core entry and exit at operator area	150.00
1—Set Dietert Sand Testing Equipment, Rammer, Dryer, Perm. Machine and Strength Tester and Extra Parts	300.00

All goods may be inspected on premises and subject to prior sale.

KENCROFT MALLEABLE CO. INC.
Buffalo 7, N. Y. Riverside 1520

For Sale

FOR SALE
COMPLETE SAND SLINGER UNIT

1—Beardsley & Piper Model DB Stationary Sandslinger, complete with motors	$2500.00
1—Head 22" with small arm 4', long arm 8' with 25 H.P. motor 1200 RPM	
1—Simplicity Shake-Out unit 5' x 6' complete with motor, 10,000# capacity	$1600.00
1—2 Ton Plate feeder, complete with supports, motor 3 HP, 440 V, 60 cycle, 3 phase	$1900.00
1—Elevator 15" W, 42" D, 26' H, with 11" Belt, Buckets 6 x 10 x 4	$ 600.00
1—Stationary Conveyor, with #4 M1-18" x 60" pan feeder, with complete supports, type 440 V, 3 phase, 50 cycle motor, with all necessary parts.	$ 900.00
	$7500.00

F.O.B. Moline, Illinois

ROCK ISLAND METAL FOUNDRY, INC.
B. W. GRAFTON
ROCK ISLAND, ILLINOIS

FOR SALE

INGERSOLL-RAND AIR COMPRESSOR, TYPE XRE, Ser. #PP BE104-105—1939
175 HP Synchr. motor 220/3/60—2 stage 14" x 12" 6" x 12"
638-C.F.P.M.—470 C.F. Free Air P.M.
Max. Delvy. 450# PSI
Intercooler—Aftercooler
Automatic Lubricating System, with comp. Elec. Mach. Automatic Control Panel—Size SPT-6.

SEABOARD STEEL COMPANY, INC.
P.O. BOX 1135
NEW HAVEN, CONNECTICUT

FOR SALE

Foxboro air weight controller, model 10, type 113, serial No. 887871.
Jeffrey Vibrating Feeder, type 3, serial No. 20449, size 12" x 10'5", with rectifier.
Jaeger mobile crane, 18' boom, solid tires.

MEECH FOUNDRY
9906 MEECH AVENUE
CLEVELAND, OHIO
TELE: MICHIGAN 1-5550

FOR SALE
MOTORS—GENERATORS
TRANSFORMERS
Unused — Rebuilt

WORLD'S LARGEST INVENTORY

ELECTRIC EQUIPMENT COMPANY
Phone Station Collect GLenwood 6783
P.O. Box 51—Rochester 1, New York

FOR SALE

2 Never Used Diamond Cherry Wood slip flasks, 18 x 18 x 6 C x 4 D, 3 D taper, ¾" double pins each end.

15 Type E T Jackets, 18 x 18 x 7 to fit, 4¼ on C, 2½ on D.

Above never used, big discount.

BOX 895, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOR SALE

1—53" Besly Flat Rock Grinder with new spare wheel, dresser and blower. Price $900.00.

1—7½ HP Fox Swing Frame Grinder, 16" x 2 wheel, like new. Price $375.00.

INDUSTRIAL FABRICATING, INC.
P.O. GENERAL DELIVERY
EATON RAPIDS, MICHIGAN

FOR SALE

1—Simpson Mixer #2, 20 HP motor.
Miscellaneous: Screens, Pulverizers, Grinders, Tyler Rotap Screens, etc.

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FOR SALE

We have the best selection of HARD CHROME REBUILT PNEUMATIC TOOLS WE HAVE EVER HAD.

Ingersoll-Rand Size 24 Floor Rammers

Ingersoll-Rand Size 14 Bench Rammers

Cleco Bench Rammers

Chipping Hammers—All types

Core Breakers and Grinders

Our prices are about half the cost of new tools. All tools sold by us are guaranteed and can be returned if found not satisfactory.

CENTRAL PNEUMATIC SERVICE COMPANY
512 LINDEN AVE., DAYTON, OHIO
TELEPHONE: MADISON 2701

FOR SALE

TURBO BLOWERS WITH MOTORS

CFM	PRESS.	MAKE	CFM	PRESS.	MAKE
8375	20oz.	Spencer	340	20oz.	A-B
6000	32oz.	Ing.-Rand	320	12oz.	Spencer
4700	32oz.	Ing.-Rand	250	12oz.	No. Am.
2500	7oz.	Sturt.	9000	6"SP	Northern
800	13oz.	Buffalo	3420	8"SP	N.Y.
500	12oz.	Buffalo	2700	⅝"SP	Ilg
450	7oz.	Spencer	2500	½"SP	American
400	16oz.	No. Am.	1100	4½"SP	Bayley
380	16oz.	No. Am.	2344	2"SP	Clarage

THE MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVE.
CLEVELAND 14, OHIO

FOR SALE

1—No. 2 Demmler air operated core machine.

4—No. 1 Demmler air operated core machines.

1—Whiting Hydro-blast barrel 42" dia. x 36" long, variable speed drive on barrel, electrically operated skip hoist for loading, complete with Worthington heavy duty pump, type VTE, with 25 HP motor.

1—North American Pressure Blower, size 1924L, pressure 24 oz., 1300 CFM, direct connected 20 HP motor.

1—Spencer Turbo-Compressor, pressure 24 oz., 675 CFM, including 7½ HP motor.

If interested, contact our Plant Engineer, Mr. VanWingen.

WOLVERINE BRASS WORKS
648 MONROE AVENUE, N.W.
GRAND RAPIDS, MICHIGAN
PHONE: GLENDALE 9-3555

FOR SALE

One—Model 70-9 Core Grinder, by Milwaukee Foundry Equipment Co. Table Dia. 70". Three Table speeds, 2, 3, and 5 RPM, 2700 lineal feet per minute. Capacity 72" Maximum Core. Grinding Wheel Dia. 30", Distance Table to wheel 24" Maximum and 2" minimum. One 3 HP Motor 860 PRM and one 1 HP 1145 RPM, both 3 phase, 440 volts. Excellent Condition. Used only 100 hours. Address: THE CHAPMAN VALVE MANUFACTURING CO., INDIAN ORCHARD, MASS.

FOR SALE

Whiting 36" x 78" exhaust tumbler, 1" shell with geared-head brake 7½ HP motor, excellent condition. Print on inquiry. Address: Box 833, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Melting Furnaces

LARGEST STOCK IN THE COUNTRY

1—Swindell 8 ton 9' diameter Shell Electric Furnace, 2500 KVA transformer, 13,800 or 11,000 V. In our Chicago warehouse.

Swindell Electric Furnace, 5' dia. shell, 350 KVA, 6600 volts.

Swindell Electric Furnace, 4' dia. shell, 250 KVA, 6600 volts.

Swindell Electric Furnace, 5' dia. shell, 500 KVA, 6600 volts.

Allis Chalmers Induction Melting Furnace, 2-600# pots.

Ajax Northrup High Frequency Induction Furnace, spark gap type, 35 KVA with 60# and 17# melting pots.

1—Detroit Electric, 1500# capacity, 13,200 primary voltage. Kuhlman transformers. Complete with controls.

Detroit Electric 350#, Type LFA with Kuhlman transformers and oil circuit breaker, 13,200 primary voltage.

Pennsylvania 1500 KVA transformer, 12,000 V. Never used since rebuilt. With complete controls, mostly new, needed for operation of a furnace. New control panel, Field Rheostat, 25 HP, 440 V MG set.

1—1500 KVA G. E. Transformer with taps for 11,000 or 13,800 volts.

Transformers—2—2500 KVA furnace transformers, 11,000 or 13,800 primary voltage.

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AIR COMPRESSORS

1—INGERSOLL RAND 12" x 10", 320 C.F.M., 60 HP.
1—SULLIVAN Type WN-3, 20" x 12" x 14", 1220 C.F.M., 250 HP.

AIR HOISTS

75—INGERSOLL RAND RC-5, 500 lbs.
10—INGERSOLL RAND LC-7, 700 lbs.
3—Ingersoll Rand Size "A" 500 lbs.
6—INGERSOLL RAND Size "B" 1000 lbs.
2—INGERSOLL RAND Size "C" 2000 lbs.
2—INGERSOLL RAND Size "D" 4000 lbs.
4—INGERSOLL RAND Size "D-6" 6000
4—INGERSOLL RAND Size "E" 10,000
5—CHICAGO PNEUMATIC 2-3-5 Ton Cap.
16—DETROIT 1-2-5 Tons Cap.
3—THORS 2-3-5 Tons Cap.

BUCKET ELEVATORS

1—LINK BELT 30' Centers, 10" x 7" Buckets.
1—LINK BELT 35' Centers, 12" x 7" Buckets.
1—LINK BELT 40' Centers, 14" x 7" Buckets.
1—LINK BELT 50' Centers, 16" x 8" Buckets.

AIR TOOLS

200—INGERSOLL RAND & CHICAGO PNEUMATIC, Grinders, Chippers, Bench & Floor Rammers.

ELECTRIC HOISTS

1—Comet 1000 lbs. capacity.
1—SHAW Box 1000 lbs. capacity.
1—CLEVELAND 4000 lbs. cap. with powerized Trolley.
1—ROBBINS & MEYERS, 4000 lbs. cap.

CUT-OFF MACHINES

3—TABOR model C10AF, Abrasive Disc, 16" Wheel, 10 H.P. Motor.
1—TESSEMER Model H, ⅜" Cap. Sprue Cutter.
1—TESSEMER Model I, ¼" Cap. Sprue Cutter.

CORE ROD STRAIGHTENERS

1—AMERICAN Type D, Pneumatic ¾" Straightener, 1¼" Shear.
2—CLIMAX #2, 2A, 1/16" to ¼".
1—CLIMAX #3, ¼" to ⅝", Length 10".

CORE GRINDERS

2—MILWAUKEE Rotary Type, Model 70-12, 70" Dia. Table, Very Late.

CORE BLOWERS

2—CHAMPIONS CB 10, Max. Core 10 lbs.
2—CHAMPIONS CB 400, Max. Core 300.
1—DEMMLER No. 55 Max. Core 6 lbs.
1—DEMMLER No. 1, Max. Core 10 lbs.
1—DEMMLER No. 1-E, Max. Core 10 lbs.
2—DEMMLER No. 2K, Max. Core 20 lbs.
2—DEMMLER No. 2E, Max. Core 20 lbs.
2—DEMMLER No. 2, Max. Core 20 lbs.
2—DEMMLER No. 3, Max. Core 35 lbs.
2—DEMMLER No. 3K, Max. Core 35 lbs.
2—DEMMLER No. 3E, Max. Core 35 lbs.
1—DEMMLER No. 4, Max. Core 100 lbs.
1—DEMMLER No. 4E, Max. Core . . lbs.
2—INTERNATIONALS No. SB, 11 Max. Core 15 lbs.
2—INTERNATIONALS No. SB 13, Max. Core 30 lbs.
1—OSBORN No. 91, Max. Core 15 lbs.
2—OSBORN No. 92, Max. Core 35 lbs.
2—OSBORN No. 192, Max. Core 50 lbs.
2—OSBORN No. 193, Max. Core 75 lbs.
6—MILWAUKEE TACCONE Model A-3, Max. Core, 4 lbs.
1—REDFORD #1 Bench Type w/cartridges.

CORE OVENS

1—INDUCTION Heating Dialectric, Model M-800A, 600 lbs. per Hr. New.
1—INDUSTRIAL "Revolving Carriers" Continuous, Trays 18" x 80", Gas Fired.
1—DETROIT Vertical Tower, 45' High, Trays 14" x 60", 31" Centers.
1—YOUNG BROS. 2-Comp. 10 Drawers, Overall 9' x 12' x 8', Gas Fired.
2—YOUNG BROS. Car Type, Single & Double Compartment, Gas Fired, Recirculating, with L & N Recorders, etc.

CORE ROOM MISC.

3000—TRANSITE Core Plates.
1—AMERICAN Rapid Core Machine.
37—NEW CORE RACKS, 5' 6" Wide, 6' High, 4' Deep, 5 Shelves, Knocked Down.
4—ROSS Single & Double Core Drawers.
20—OSBORN, INTERNATIONAL & TABOR Core Rollovers, Various Sizes.

CUPOLA BLOWERS & ACCESSORIES

1—ROOTS CONNERSVILLE, Size 20 x 44, 7000 CFM, Type HD, 50 HP Motor.
1—INGERSOLL RAND Centrifugal, Type FS-357, 7000 CFM with 60 HP Motor.
1—BUFFALO FORGE 5E, 3200 CFM, 25 HP Motor.
4—LINDBERG Centrifugal Blowers 2100 CFM, with 15 HP Motors.
1—BASIC REFRACTORIES BRI Gun, Model 110.
3—HAUCK Cupola Lighter & Tanks.
5—WHITING 42" Dia. Charging Buckets.

DUST COLLECTORS & ROTO-CLONES

1—AMERICAN Air Filter No. 12, Type W, arrangement "C," with Sludge Ejector.
1—AMERICAN Air Filter No. 14, Type W, arrangement "C," with Sludge Ejector.
1—AMERICAN Air Filter No. 27, Type W, arrangement "C," with Sludge Ejector.
1—AMERICAN Air Filter Type N, Size 10 with Bench.
1—AMERICAN Air Filter Type N, Size 20, 20,000 CFM, with 75 HP Motor.
1—AMERICAN Air Filter Type N, Size 24, 24,000 CFM, 75 HP Motor.

ELECTRIC ARC MELTING

2—DETROIT Rockers. Indirect Arc, Type AA, 750-1000 lbs. capacity. Complete with 200 KVA Transformers, Control Panels, Automatic Electrode Holders.
2—DETROIT Rockers. Indirect Arc, Type AA, 1000-1500 lbs. capacity. Complete with 250 KVA Transformers, Control Panels, Automatic Electrode Holders.

GAS & OIL FIRED FURNACES

1—LINDBERG FISHER Model MNP, Size 225, Electric Tilt, with Motor & Blower.
6—LINDBERG FISHER Model MNP, Size 1700, Electric Tilt, with Motor & Blower.
3—LINDBERG FISHER Model MNP, Size 2400, Electric Tilt, with Motor & Blower.
2—LINDBERG FISHER, Type BB1, Size 225, Hand Tilt, with Motor & Blower.
12—LINDBERG FISHER, Model SSH, Size 550, Stationary, Complete Motor & Blower.
6—LINDBERG FISHER, Model SSH, Size 150, Stationary, Motor & Blower.
3—LINDBERG FISHER, Model SSH, Size 60, Stationary, Motor & Blower.
10—CAMPBELL HAUSFIELD. Stationary, Size 125 to 250, Motor & Blower.
2—CAMPBELL HAUSFIELD, Model IPNT, Size 2000 lbs., Electric Tilt, with Motor & Blower.

GRINDERS—SWING FRAME

1—MARSHKE, 12" x 2", 3 HP.
1—MARSHKE, 20" x 10", 10 H.P.
2—FOX, No. 6, 24" x 10", 15 HP.
1—U. S. ELECTRICAL, 24" x 10", 15 HP.

GRINDERS—SNAGGING

3—U. S. ELECTRICAL, No. 65, 24" x 3" x 12" Wheel, 15 HP, 4-Speeds.
3—U. S. ELECTRICAL, No. 65, 30" x 4" x 12" Wheel, 20 HP, 4-Speeds.
2—U. S. ELECTRICAL, No. 64, 14" x 3" Wheel, 7½ HP, 4-Speeds.
1—HAMMOND, Model WR-1, 24" x 3" x 12" Wheel, 10 HP.
2—SAFETY BITES, No. 174, 24" x 3" x 12", 10 HP.

GRINDERS—DISC

1—QUEEN CITY, Model 100 Double End Disc Grinder, wheel size 20" x 2" x 2", with 10 HP Motor.
1—U. S. ELECTRICAL TOOL, No. 80, Double End Disc Grinder, Wheel size 16" x 3", With 7½ HP Motor.

HEAT TREAT FURNACE

2—LINDBERG, Model 4860 GH, Gas Fired 48" x 60", Recirculating, with L & N Controls to 1250° F.
1—LOFTUS ENGINEERING CORP. Annealing, Walking Beam Type, Gas Fired, 1600°, Recirculating, 10' x 12' x 40'. New 1951.
1—AMERICAN, Model 150-DC, ID 5" x 10" x 18". To 2350° F.
1—AJAX MFG. Electric, ID 54' Long, 46" Wide, 36" High, 800°. Single Phase.

INDUCTION—MELTING—HEAT TREAT

1—GENERAL ELECTRIC MG Set, 300 KW, 450 HP Motor, 3000 Cycles, with Starter & Panel Boards.
1—GENERAL ELECTRIC MG Set, 50 KW, 125 HP Motor, 960 Cycles, with Starter & Panel Board.
1—GENERAL ELECTRIC MG Set, 1250 KW, 1850 HP Motor, 3000 Cycles, with all Controls.
1—LEPEL Spark Gap Converter, 30 KW.

LADLES

3—WHITING Cylindrical, 275 lbs. 19" x 26".
6—MODERN Cylindrical, 1500 lbs. 29" x 30".
2—STEVENS Cylindrical, 2450 lbs. 29½" x 41½".
12—WHITING Lip Pour, 1200 lbs., 23" x 23".
6—MODERN Lip Pour, 1600 lbs. 24" x 24".
4—MODERN FA-9 Pouring Devices and 400# Ladles.
2—WHITING Lip Pour, 2000 lbs., 29½" x 29½".
3—WHITING Lip Pour, 4000 lbs., 32" x 32".
1—WHITING Lip Pour, 6000 lbs., 36" x 36".
3—WHITING Lip Pour, 5060 lbs., 34" x 34".
1—WHITING Lip Pour, 8000 lbs., 44" x 48".
2—WHITING Lip Pour, 20,000 lbs., 62" x 62".
2—WHITING "U" Type; 5900 lbs., 42" x 72" x 36".

MOLDING MACHINES JOLT SQUEEZERS

2—MILWAUKEE No. 123, 12" cyl., stationary.
2—Milwaukee No. 104, 10" cyl., portable.
8—OSBORN No. 275 JW, Straddle Type, 10" Cyl., Portable.
16—OSBORN No. 275J, 10" Cyl., Portable.
3—OSBORN No. 276J, 12" Cyl., Portable.
6—OSBORN No. 210 PJ, Swing Back Head, 10" Cyl., Stationary.
6—OSBORN No. 212 PJ, Swing Back Head, 12" Cyl., Stationary.
1—CHAMPION No. JS-10-P, 10" Cyl., Swing Back Head, Portable.
20—SPO No. 110J, 10" Cyl., Portable.

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JOLT ROLLOVER PATTERN DRAW

1—B. & P. No. 920 RCX Rol-A-Draw, 44" x 64" Table, 20" Draw (New).
1—DAVENPORT No. 28R, 34" x 48" Table, 12" Draw.
1—DAVENPORT No. 40-SA, 42" x 50" Table, 3000 lbs. Jolt, 18" Draw.
1—HERMAN #6000 Series, 42" x 78" Table, 6000 lbs. Jolt Cap., 20" Draw.
1—HERMAN #1500 Series, Table 26" x 30", Jolt 1500 lbs.
1—HERMAN #750 Series, Table 20" x 30", 750 lbs. Jolt.
6—INTERNATIONAL "R" Core Rollovers.
1—INTERNATIONAL "G" Size 20" x 8".
1—INTERNATIONAL "G" Size 24" x 10".
1—INTERNATIONAL "G" Size 30" x 12".
1—INTERNATIONAL No. RES, Size 15" x 8".
1—INTERNATIONAL Type "F," 31" x 54", Draw 16", Jolt Cap. 2500 lbs.
1—JOHNSTON & JENNINGS #612-RP, Table 24" x 30", Draw 12", Jolt 600 lbs.
1—Johnston & Jennings 815-B table 30" x 40", draw 15", jolt 1500 lbs.
1—MILWAUKEE #167, Table 32" x 33", Draw 12", Jolt 1000 lbs., Sq. Cyl. 16".
1—MILWAUKEE #217, Table.
1—Milwaukee 60-B-3.
2—OSBORN No. 142, Table 14½" x 24", Draw 8", 350 lbs. Jolt.
10—OSBORN No. 40 and 42, Hand Core Rollovers, 18" x 8" Draw.
1—OSBORN No. 342, Table 23" x 38", Draw 10", Jolt 1000 lbs.
1—OSBORN No. 442, Table 21" x 31", Draw 10", Jolt 600 lbs.
1—OSBORN No. 242, Table 29" x 42", Draw 19", Jolt 1500 lbs.
2—OSBORN No. 405, Table 57" x 64", Draw 26", Jolt 3000 lbs.
6—OSBORN No. 601, 30" wide Flask, 10" Draw, 750 lbs. Jolt.
6—OSBORN No. 602, 36" Wide Flask, 10" Draw, 750 lbs. Jolt.
2—OSBORN No. 332, Flask Size 26" x 36", Draw 9", Sq. Cyl. 16", 1500 lbs. Jolt.
1—SPO No. 413D, Table 24" x 25", Draw 10", Jolt 600 lbs., Sq. Cyl. 13".
1—SPO No. 507, table 32" x 40", draw 10" to 20", jolt cap. 1500 lbs.
3—TABOR, Size 30" x 40" Table, 12" Draw, 1000 lbs. Jolt Cap. Portable & Stationary.
4—TABOR, Size 22" x 32", and 22" x 42", Draw 10", Jolt 600 lbs.

JOLT PIN LIFT

1—DAVENPORT No. 40 AJS, Table 44" x 54", Jolt 4000 lbs., Draw 18".
1—INTERNATIONAL Model JDP, Size 600 x 8".
1—INTERNATIONAL LP10, 30" x 30" Table.
1—MILWAUKEE No. 1536, Table 32" x 38", 1500 lbs. Jolt.
2—MILWAUKEE No. 620 ND, 24" x 30" Table, 2000 lbs. Jolt.
2—OSBORN No. 559, Table 25" x 30", Draw 6", Jolt 1200 lbs.
1—OSBORN No. 563, Table 55" x 63", Draw 12", Jolt 7000 lbs.
1—TABOR, Table 22" x 32", Draw 10", Jolt 600 #.

JOLT SQUEEZE PIN LIFT

1—INTERNATIONAL PKL, 12", Squeeze Cyl., 6" Draw.
1—MILWAUKEE 125-3, Table 21" x 27", Jolt 1200 lbs. Draw 8", Squeeze Cyl. 12".
2—MILWAUKEE No. 165, Table 24" x 34", Draw 8", Squeeze Cyl. 16".
1—MILWAUKEE No. 163, Table 15" x 24", Draw, 8". Jolt 1500 lbs., Squeeze Cyl. 16".
1—OSBORN 175J table 18" x 21", draw 5" sq. cyl. 10".
2—OSBORN No. 710 Table 17" x 21", Squeeze Cyl. 10".
4—OSBORN No. 716 PJ, Table 22" x 34", Draw 7", Squeeze Cyl. 16".
1—SPO 2114, table 20" x 27", 4" draw, 600 lbs. jolt, 11" cyl.
2—SPO 2136G, table 19" x 26", 6" draw, 13" cyl. portable.

JOLT (BUMPERS)

1—HERMAN, 40" x 60" Table, 13" Cyl. 6000 lbs. Jolt.
1—MILWAUKEE No. 4050, 40" x 50" Table, 12" Cyl.
1—TABOR, Table 30" x 40".

ROTO-LIFTS

2—OSBORN No. 1510, table 22" x 26", draw 20", jolt cap. 1500#, new 1949.

MATERIAL HANDLING EQUIPMENT

1—ERIE ¾ yard clamshell bucket, single line.
1—INGERSOLL RAND, Size MHU, Air Winch, 2000 lbs. Cap.
1—LINK-BELT Car Puller, 5000 lbs. cap. (3 s. Cars).
6—READY POWER UNITS, 4 & 6 Cylinder.
3—AUTOMATIC Fork Pallet Trucks, 4000 lbs. cap. 7" Lift.
6—LEWIS SHEPPARD Platform Hand Lift Trucks (For Core Room).

CONVEYOR BELTS

1—JEFFREY Trough, 24" x 35' centers.
1—JEFFREY Trough, 24" x 103' Centers.
1—JEFFREY Trough, 24" x 385' Centers.
1—JEFFREY Trough, 24" x 145' Centers.
1—JEFFREY Flat 24" x 385' Centers.
1—JEFFREY Trough 24" x 35' centers.
1—LINK BELT Flat 24" x 40' Centers.

STEEL APRON

1—JEFFREY 24" x 60' Centers.
1—JEFFREY 24" x 117' Centers.

VIBRATING

3—SIMPLICITY Model OA-10-A, 36" x 15'.

PORTABLE TROUGH

1—FARQUHAR, 18" x 35'.

UNDER CAR UNLOADER

1—FARQUHAR, 18" x 19'.

TRAMRAIL

3—LOUDEN MONORAIL SYSTEMS, "Super Track"
(1) 110' of 6" I-beam & two 20' bridges
(2) 140' of 6" I-beam & two 12' bridges
(3) 130' of 11" I-beam & two 30' bridges; All Complete.

OVERHEAD CRANES

1—WHITING 5 ton Overhead Crane, 50' span, Cab Operated, AC.
1—SHEPARD NILES Overhead Crane, 66½' span, 15 Ton Cap.
1—ELECTRIC BRIDGE Crane, 25' Span, with 2 Ton R & M Hoist, 150' track.

MOLD DRYERS

1—PORBECK Mold Dryer, 42" wide, 8' long, oil fired, Serial No. 242.

MOLD CONVEYOR

1—WEBB 109 Cars, Car Tops 32" x 39".
1—LINK BELT, 98 Cars, Car Tops, 32" x 39".

ROLLER CONVEYOR

400' MATHEWS 16" wide, rollers on 3" centers, 2 $\frac{9}{16}$" dia.

SAND MULLERS

1—BEARDSLEY & PIPER, #30 with Skip Hoist & Dust Hood, 20 HP.
1—BEARDSLEY & PIPER, #50 with Skip Hoist, Dust Hood, 50 HP.
1—BEARDSLEY & PIPER, #70 with Dust Hood, 100 HP Motor.
1—CLEARFIELD, #404 Batch, 4 Cu. Ft.
1—CLEARFIELD, #610 Batch, 6 Cu. Ft.
1—SIMPSON, #1 Style B, Single Wheel, 400# Batch.
1—SIMPSON, #3 Style C, Enclosed Gears —3000#.
2—SIMPSON PORTAMULLERS.
1—SIMPSON, #2, Style UD, 1500 lbs. Batch.
1—SIMPSON, #2, Style C, 1500 lbs., with Loader. Enclosed Gears.

SAND PREPARATORS

1—B & P, No. 40, 40 Ton Hopper.
6—B & P Screenarators, Models—S, M & L.
1—PEKAY Aerator, Model 320-3. (For Sand System).
8—ROYERS. Models NDP-C-2.

SAND CUTTERS

1—AMERICAN, Model BD-Size 75/60.
1—AMERICAN, Model M-Size 90/80.
1—AMERICAN, Model M-Size 89/70.
2—MOULDERS' Friend 50" and 60" brush.

SAND SLINGERS

1—B & P, 19" Tractor Type, 13' Arm.
1—B & P, 16" Tractor Type, 13' Arm, Magnetic Tower, 4' Ramming 4" Tip.
2—B & P, Model 16S-DB Stationary Type, 16" Head.
1—B & P Stationary-Double Belt Model, 5' arm, 4' Ramming, 19" Head, 4" tip. Never Used.

SHAKEOUTS & SCREENS

4—SIMPLICITY 4' x 8' Model D, 16,000#.
4—SIMPLICITY 4' x 6' Model B, 5000#.
1—SIMPLICITY 4' x 10' Model D, 16,000#.
3—SIMPLICITY 3' x 6' Model BG, 5000#.
1—SIMPLICITY 6' x 8' Model DE, 32,000#.
1—ROYER Combination Shakeout & Sand Conditioning unit, Serial #ST-47.
1—HEWITT-ROBINS 36" x 78", Vibrex Screen, Style M-7.

TUMBLING BARRELS

1—ROYERSFORD 36" x 60", 5 HP Motor.
2—SLY 42" x 72" Square, 10 HP, Gearhead with Built-in Brake. Timken Bearing.
2—SLY 36" x 84" Type C, 7½ HP, Gearhead with Built-in Brake. Timken Bearing.
4—WHITING 48" x 72", 10 HP Gearhead, with Built-in Brake. Timken Bearing.

WHEELABRATORS

1—AMERICAN 27" x 36" Tumblast with Skip Hoist Loader.
1—AMERICAN 36" x 42" Tumblast with Skip Hoist.
1—AMERICAN 42" x 48" Tumblast, with Skip Hoist.
1—HOLLINGSWORTH Model 44" x 48" Tumblast.
1—PANGBORN Shot Blast Room 10' x 12' x 14', with Dust Collector, Elevator.
1—PANGBORN 9LG, 9' Table, 8-24' Tables.

TESTING EQUIPMENT

1—GENERAL ELECTRIC X-Ray, Industrial Type, Model KX10., 140 KW.
1—STEEL CITY Brinell Hardness Tester, Model UK 300, To 3000 Kilograms.
1—STEEL CITY Brinell Hardness Tester, Model 0-4500 4¼" Piston.
1—DIETERT Complete Lab. for Sand Testing.

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THE ACME BARGAIN PAGE

AIR COMPRESSORS
Ingersoll Rand Type 10—14 x 9 x 12, 2 stage, 75 Hp, 3/60/220/1200 rpm synchronous motor, 350 CFM at 100#.
Ingersoll Rand Type 10, 800 CFM, 2 stage air compressor, 200 HP, 220 V motor. Rebuilt 1952.

AIR HOISTS
6—4000# Ingersoll-Rand, with trolleys.

BLOWERS
Ingersoll-Rand Motor Blower Type FS. Single Stage 4000 CFM @ 3.75 PSI, 100 HP, 220V G. E. Induction motor.
General Electric 7500 CFM, 20 oz., 89.6 Max. HP, 220V motor, Airway controls.
Ingersoll-Rand turbo compressor 10500 CFM @ 20 oz. 85 HP G. E. 220V 3500 CFM motor.

CLEANING EQUIPMENT
Sly 8′ dia. Table Shot Blast Unit.
36 x 42 Halloway 7½ HP shot motor elevator and dust collector.

CORE BLOWERS
3—International SB 12.
4—International SB 13.
10—Osborn 193.
1—Osborn 2035-2.
1—Peterson (Similar to Demmler #50).
1—Champion CB 400.

CORE GRINDERS
6—Milwaukee 70-12 and 70-9.

CORE OVENS VERTICAL HORIZONTAL
1—Coleman, combination oil or gas fired 43 carriers 24″ x 90″—1 hour 12 min. to 4 hours 48 min. cycle.
1—Coleman, combination oil or gas fired 43—2 shelf carriers 30″ x 144″ long. 2 hour 12 min. to 7 hour 24 min. cycle. Present replacement cost over $90,000.

CORE PASTE OVENS
3—Coleman Gas Fired 28′-25″ x 42″ opening Complete.

CRANES
1—Milwaukee 10 ton 40′ span, 22′ lift, 220 V. A.C.
2—Northern 5 ton 40′ span, 22′ lift, 220 V. A.C.
1—Whiting 5 ton 40′ span, 22′ lift, 220 V. A.C.

GRINDERS
Horizontal Disc (Flat) Grinders:
Gardner #186, 30″ dia. disc. 10 HP, 220/440V, with dresser, wet or dry grinder.
Gardner HV5A, 18″ dia., 7½ HP, 440V, with dresser.
Double End Disc:
2—U.S. 18″ wheels, 2 swing tables, 1 with lever feed.

GRINDERS, SNAGGING
2—Hammond 10 WRI Double End Snag. Grinders 20″ dia. wheels, 10 HP 220/440 v motors, variable speed drives.
2—3″ x 24″ U.S. #65, 20 HP 220/440V.

GRINDERS, SWING FRAME
2—3″ x 24″ x 12″ Fox #4, 15 HP.
1—3″ x 24″ x 12″ Marschke, 20 HP.
1—3″ x 24″ x 12″ U. S. 15 HP.

HOT METAL CARRIERS
3—1 ton D.C. Cab operated Cleveland, Monotractor Hot Metal Carriers.

MOLDING MACHINES
Jolt Squeezers:
5—Milwaukee 103-11 Staty. Jolt Squeezers, 13½″ x 20″ table.
7—Champion JS10P Portable Jolt Squeeze molding machine. 18″ x 21″ table.
5—Osborn 275J.
1—Spo 110J.
Jolt Squeeze Pin Lifts BIG
2—International PK 20's. 20″ squeeze cylinder 8″ draw. Ser. #67237. New 1949.
2—Milwaukee Jolt Squeeze Strippers, Model 168-50, 15″ x 24″ table 16″ X open end pattern size.
1—Milwaukee 126-3 Jolt Squeeze Pin Stripper, 27″ x 21″ table, 8″ draw. Portable.
3—#165 Milwaukees.

ROLLOVERS
Jolt Rollover Pattern Draw
1—Herman 4000# Series 30″ x 60″ table, 32″ x 48″ bumper.
1—Herman 3000# Series 40″ x 84″ table, special slotted table.
1—Herman 1500# Series 20″ x 36″ table.
2—Herman 750# Series 20″ x 30″ table.
2—Herman 750# Series 20″ x 24″ table.
1—Davenport 24 SA Jolt Rollover Pattern Draw. 26″ x 42″ flask size, 12″ draw.
3—Spo Model 9032.
1—Milwaukee 217.
2—International Type G, Portable, 20″ x 8″ draw.
2—Tabor Portable Rollover 30″
Johnson & Jennings 1020-44 x 44 max. Flask Size.

PIN LIFT PUSHOFFS
2—Champion Pin Pushoffs 28″ x 42″ table 10″ draw.

MULLERS AND MIXERS
Simpson #3 Type H open gear type.
Beardsley & Piper #70 Speedmuller, New style cross head.

6 No. 2 Simpson Mullers

OVENS, MOLD OR CORE
Porbeck Double Car Single door 16′ long 14′ wide 7½ HP car puller, in place St. Louis, Mo.
Despatch Type S, 2 cars 27½ x 54 x 64, Gas Fired.

OVERHEAD TROLLEY CONVEYORS
5000′ Jervis B. Webb & Link Belt 658 chain, 4 D.C. motor drive and MG set.

POURING DEVICES
3—Pouring devices, Whiting 500#.

SANDBELT CONVEYORS
160′-30″ Trough with Drives.
123′-30″ Trough with Drives.
144′-30″ Flat with Drives.
47′-30″ Trough with Drives.

SAND CUTTERS
1—Model M Screenarator.

TUMBLING BARRELS
1—Sly 36 x 72
3—Royersford 42′ x 72′ Roller Bearing, Chain Drive.
1—Sly Square 42 x 42 x 64.
1—Sly 42″ Dia. x 56″.

STRAIGHTENING PRESS
Hannifin 50 ton hydraulic

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BARGAIN PRICES

GUARANTEED REBUILT EQUIPMENT

BLOWERS
1—85 HP G.E. Cupola Blower, 24 oz.
3—7½ HP FISHER, 16 oz.
15—CENTRIFUGAL BLOWERS, 350 CFM to 10,500 CFM.

CLEANING EQUIPMENT
1—AMERICAN #1 MULTITABLE, 6 aux. tables 15", main table 45".
SHAKEOUT 4' x 6'.
1—AMERICAN #2 MULTITABLE, 5 tables, 37" dia.
5—US GRINDERS, double end, 10, 15, 20 HP.
4—GRINDERS, Swing frame, 15 HP.
2—TUMBLING BARRELS, Cast Iron, 36" x 24" w/2 HP Motor.
2—TUMBLING BARRELS, Square, 34" x 48".
2—TUMBLING BARRELS, Side Tilt, 18" wide x 20" deep.

CONVEYORS
1—LINK BELT Double Deck Oscillating, 80' long x 24" wide, 1954.
1—45' x 24" wide APRON CONVEYOR
4—SAND ELEVATORS, various sizes.
1—STEEL PLATE MOLD, 90' centers, 30" belt, w/drive.
2—STEEL PLATE MOLD, 90' centers, 24" belt w/drive.
6—SAND BELT CONVEYORS, 10' centers to 140' centers, 18" to 36" belt, complete w/drives and hoppers.
2—CASTING CONVEYORS, wire mesh, 18" x 32" w/drive.

CUPOLAS
2—WHITING #6, Complete with Skip Charger.
1—WHITING #5, w/Skip, Spencer Blower, Foxboro controls, 2 yrs. old.
1—MORRIS #0, w/skip, mixing ladle, never used.
1—MODERN, #3, 46' shell, w/blower.
2—MODERN #7; Blowers & Controls.
1—SKIP CHARGER, 3 bottom drop buckets, scale for #9 cupola.

CORE BLOWERS
1—3K DEMMLER.
1—8B 13 INTL.
6—#2 DEMMLER.
1—CB-400 CHAMPION.
1—#55 DEMMLER.

FLASKS
150—HINES & FREEMAN ALUM. Pop-offs and jackets, send for list.
TRANSITE CORE PLATES, send requirements.

FURNACES—DIRECT ARC MELTING
1—250#/hr. Hydraulic Top Charge.
1—3000#/hr. LECTROMELT.
1—1000#/hr. HEROULT.
1—2,000#/hr. HEROULT.
2—3000# HEROULTS.
1—3 Ton HEROULT.
1—6 Ton HEROULT.

FURNACES—INDIRECT ARC
1—60# DETROIT, complete.
1—350# cap. DETROIT, complete.
1—1000# cap. DETROIT, complete.
1—2000# DETROIT, complete.

FURNACES—INDUCTION MELTING
1—500 KW AJAX, complete.
1—300 KW AJAX, complete.
1—175 KW AJAX, complete.
3—333 KW, AJAX-TAMA-WYATT, 1500# Alum.
2—60 KW AJAX, 60 Cycle, 400#, Alum.
1—7½ KW TOCCO
1—20 KW AJAX Spark Gap High Freq.
1—3 KW AJAX, Lab. type.
1—30 KW LEPEL.
1—50 KW, G.E., MG Set, 960 cycle.

FURNACES—OIL AND GAS
1—FISHER 4 Burner MNP, 1700#, gas.
4—FISHER, Stationary Holding, 500#, gas.
3—WALKER YORK #400 cruc. tilting, coke fired.
1—SKLENAR 600#, Oil fired.
1—HAUSFELD Tilting, 1200# Mag.
1—R & S Convection Draw, Car bottom, 18' l x 8' w x 5' h, oil fired, dismantled, controls.

MOLDING MACHINES
Jolt Rollovers
2—J & J #1020, 50" x 60", 20" draw, 1953.
1—J. & J. #918, 44 x 54", 18" draw.
1—OSBORN #405, 64 x 50", 18" draw, 3000#.
1—J & J #612, 24" x 30", 12" draw.
2—J & J #815, 30" x 40", 15" draw, 1200# jolt.
1—HERMAN, 8' x 12' Table.
2—HERMAN, 1500#, above ground.
2—HERMAN, 20" x 24", 750#.
1—HERMAN, 50" x 72", 6000# jolt.
1—HERMAN, 42" x 78", 6000# jolt.
1—OSBORN, #243, 27" x 40", 20" draw.
4—TABOR, 22" x 42", pattern draw, port.

Bumpers
1—OSBORN #102.
1—HERMAN, 60" x 72".

Jolt Strippers
4—MILWAUKEE #1536, 32" x 38".
4—SPO, 24" x 24".

Jolt Squeeze Strippers
1—OSBORN #175, 21" x 18", portable.
2—MILWAUKEE #163.
1—MILWAUKEE #165, 16" Pin Strip
1—MILWAUKEE #124-6, 12" Pin Strip.

Jolt Squeezers
2—INTERNATIONAL, 17" x 20", port.
1—OSBORN #212 PJ, 17" x 23", stationary.
4—OSBORN #276-J.
3—OSBORN #275-J.
3—TABOR, 18" x 20", 3" jolt, column.
1—TABOR, 18" x 20", 3" jolt, cantilever.
1—ADAMS, 19" x 20" portable.
2—SPO #213-GP
1—SPO #110-J

LADLES & POURING DEVICES
2—WHITING 3 Ton. Bottom pour.
4—10 TON BOTTOM POUR, 55" x 55".
2—45 TON TREADWELL, Excellent.
4—800# Worm Geared, Lip Pour
3—1500# TEAPOT, Lip Pour, Worm Geared.
3—5 Ton to 9 Ton, Worm Geared, Lip Pour.
1—SWINDELL, Elec. Holding.

MULLERS AND MIXERS
1—SIMPSON #0
1—SIMPSON #3, enclosed gears.
2—SIMPSON #2, Unit Drive.
2—CLEARFIELD #610 and #920.
1—B & P SPEEDMULLER, #70.
1—BEARDSLEY & PIPER #60 SPEEDMULLER, 60 HP motor, SKIP-LOADER.
1—B & P MULBARO, #7, extra Base.

OVENS
1—FOUNDRY EQUIP. CO., 2 comp., rack, 12'-10" x 15'-8" x 7'-10"; oil, external recirculating.
1—TOWER CORE OVEN, 14" x 60" trays, 45' high, gas fired, dismantled.
2—ROSS 2 comp., rack, gas, 6½ x 14 x 7.
1—PORBECK, 4 drawer, double end, oil.
1—YOUNG BROS. 3 compartment, kiln type electrically heated, with CONTROLS.
1—YOUNG BROS. 2 compartment, drawer type, oil or gas, 82" h x 12' w x 6' l.
1—YOUNG BROS. 3 door, gas, 12' x 8' x 6'-3", recirculating, blower and recorder.
1—COLEMAN, Oil, 2 Comp., Rack Type, Recirc; each comp. 60" wide x 80" high x 14'-6" deep.
1—COLEMAN, Double Door, Oil, Single Comp., Recirc., 60" wide x 14'6" deep x 80" high.

SAND CUTTERS
4—AMERICAN SAND CUTTERS.
1—MODEL "K", 72" reel, Gas Driven.
1—MODEL "F", 80" reel, Gas Driven.
1—MODEL "D", 76" x 96".
1—SANDMASTER, 70/102, New in 1956. Rubber Tires.

SAND LABORATORY EQUIPMENT
1—Complete SAND LABORATORY
1—TEST CORE BAKING OVEN #606.

SAND PREPARATORS
2—JEFFREY SANDITIONERS, Portable.
2—ROYER SAND BLENDERS, 16" belt.
5—ROYER SAND BLENDERS, 12" belt.
1—LINK BELT REVIVIFIER, Size 5.
1—HETHERINGTON & BERNER SAND DRYER, rotary, oil fired #552.

SAND SLINGERS
1—BEARDSLEY & PIPER MOTIVE JR. 19" head.
1—BEARDSLEY & PIPER TRACTOR TYPE 16" head magnetic separator.
1—PORTABLE SLINGER 16" head, 4' long, on Truck.

TESTING MACHINES
1—TINIUS OLSEN, UNIVERSAL, 100,000# capacity.
1—TINIUS OLSEN, BRINELL HARDNESS, 3,000 KG.
1—RIEHLE, UNIVERSAL, 2 screw mechanical, 100,000# capacity.
1—BALDWIN, UNIVERSAL, Hydraulic tensile, 60,000#.

TRUCKS
1—HOUGH PAYLOADER, Model HA, Hydraulic Trip.
2—BELL PRIME MOVERS, 1000# capacity, gas driven.
1—LEWIS SHEPPARD, 4000#, elec. Fork Lift.

MISCELLANEOUS
1—GARDNER VERTICAL DISC GRINDER.
6—PENN DUMP BUCKETS, 1000# to 4 ton.
4—CURTISS AIR HOISTS, barrel type.
1—HOFFCO Vacuum Cleaner, #75.
1—ALLEN-BILLMEYER Vacuum Cleaner, port.

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MUST BE REMOVED FROM PREMISES IN 30 DAYS

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1—INGERSOLL RAND ER-1, Size 12 x 10, CFM 320, with 60 HP Motor, Mag. Starter and Air Receiver.

GRINDING EQUIPMENT

2—U.S. ELECTRIC Double End Snag, 5 HP, 220/440, and 3 HP.
1—VAN DORN Rotary Grinder, 3 HP.

LADLES AND POURING DEVICES

2—MODERN FA-9 Pouring Devices
2—MODERN 25″ x 25″ Lip Pour Enclosed Gear, 1700 lb. cap.

MOLDING MACHINES

1—DAVENPORT 24-AJS Jolt Pin Lift, table 24″ x 30″, jolt 1000 lb., 8″ draw.
1—DAVENPORT 24-AJ Plain Jolt, 1000 lb. jolt, 24″ x 30″ table.
1—JOHNSON & JENNINGS 815 Jolt Rollover Pattern Draw, 30″ x 40″ table, 15″ draw, 1500 lb. jolt.
1—JOHNSON & JENNINGS 612-B Jolt Rollover Pattern Draw, 24″ x 30″ table, 12″ draw, 600 lb. jolt.
2—MILWAUKEE 104 Jolt Squeezers, 17″ x 20″ table. 10″ cylinder, portable.
1—MILWAUKEE 60-B-3 Jolt Squeeze Rollover Pattern Draw, 60″ flask size.
1—OSBORN 275-J Jolt Squeezer, 16″ x 20″ table. 10″ cyl., portable.
1—OSBORN 712-PJ Jolt Squeeze Pin Lift, 18″ x 28″ table, 6″ draw, 12″ sq. cyl., stationary.
2—OSBORN 601 Jolt Rollover Pattern Draw, 30″ flask, 10″ draw, 600 lb. jolt cap.
2—OSBORN 602 Jolt Rollover Pattern Draw, 22″ x 36″ table, 10″ draw, 750 lb. jolt cap.
1—TABOR Hand Core Rollover.
3—TABOR Jolt Squeezers, 16″ x 20″ table, 10″ cyl., portable.

SAND CONDITIONERS

2—MOULDERS FRIEND 50″ and 60″ cutting cylinders, 220/440 volts.

SAND MULLER

1—MIXER MULLER, 3½ cu. ft. cap., portable on pneumatic tires, 1½ HP 220/440 volt.

TUMBLING BARRELS

1—SLY 24″ x 60″ x 1″ plate, motorized.
1—SLY 30″ x 48″ x 1″ plate, motorized.

WHEELABRATORS

1—AMERICAN 36″ x 42″ Tumblast, with shot return, skip hoist and dust collector.
1—AMERICAN #1A Tablast, 4′ main table.
7—14″ Multi-tables with shot return and all electrical.

566 SETS STEELFLASKS

Quantity	SIZE	COPE	DRAG
20—Sets	18 x 32 Cast Iron	7″	7″
8—Sets	15 x 26 Steel	16″	6″
4—Sets	30 x 40 Steel	21″	21″
10—Sets	30 x 40 Steel	7″	
60—Sets	23 x 35 Steel	4″	
14—Sets	22 x 36 Steel	11″	
9—Sets	22 x 36 Steel	5″	6″
5½—Sets	24 x 24 Steel	6″	5″
22—Sets	22 x 36 Steel	6″	
9—Sets	22 x 36 Steel	5″	
25—Sets	22 x 28 Steel	6″	6″
4—Sets	21 x 21 Steel	12″	
8—Sets	21 x 21 Steel	6″	
6—Sets	21 x 21 Steel		
5—Sets	22 x 38 Steel	5″	
3—Sets	17 x 47 Wood	5″	5″
5—Sets	22 x 38 Steel	11″	
8—Sets	33 x 33 Steel	16″	
3—Sets	42 x 42 Steel	6″	
112 pcs.	24 x 24 Steel	Assorted	
15—Sets	19 x 19 Steel	10″	10″
1—Set	40″ Diam (Cast)		
24—Sets	30 x 30 Steel	6″	5″
4—Sets	35 x 43 Steel Never Used	18″	18″
32—Sets	24 x 28 Steel	8″	
26—Sets	24 x 28 Steel 4″		
4—Sets	24 x 28 Steel		4″
10—Sets	24 x 24 Steel	12″	6″
6—Sets	24 x 24 Steel	8″	5″
6—Sets	18 x 30 Steel	12″	6″
7—Sets	18 x 30 Steel	12″	
5—Sets	28 x 40 Wood	5½″	5½″
8—Sets	30 x 30 Steel	12″	12″
7—Sets	22 x 28 Steel	6″	6″
3—Sets	14 x 22 x 23 (Triangular Cast)	5″	8″
46—Sets	16 x 24 Wood	5½″	3″
22—Sets	16½ x 22 Wood	3½″	3″

MISCELLANEOUS

3—Platform Scales, 100 lb. to 300 lb. capacity.
350′ LOUDEN 6″ Monorail.
10—Core Racks, 3′ x 6′ x 5′.
3—Desks
1—Time Clock
Lot of Shovels, Ladle Bails, etc.
Other miscellaneous items too numerous to mention.

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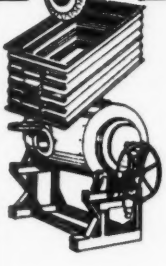

STEEL APRON CONVEYORS:
Midwest—36" x 120'
Palmer-Bee—30" x 19', 30" x 5'6"

MOLD CONVEYORS:
1—Webb heavy duty 356'
109 cars 32" x 39"
1—Link-Belt 27" x 70'6"
35 cars 38" x 72"

TUMBLING MILL:
60" x 72" Ronsohoff Tumbling Type Wet Cleaning Mill End load. Motor driven with 15 HP 3/60/220 motor. Complete with bucket loader, motor driven with 5 HP 3/60/220 motor. Serial No. 6318

AIR COMPRESSOR
1—I-R two stage 800 CFM 150 H.P. 3/60/220

OVERHEAD CRANES
1—3 ton Bedford—40' span, 120' runway
1—3 ton Shepard—Monorail 25 HP, 550 DC
1—Chisholm Moore Cupola Charing with 200' monorail—550V. 3/60

MAGNESIUM CLEANING CABINETS
7—Whirlpeol Duplex, 800 CFM, 100" wide x 65" deep x 90" high Buffalo exhausters—7½ H.P., 220/440.

We buy and sell one piece of equipment or complete Foundries.

FOR SALE: Complete Gray Iron Foundry with #7 Whiting cupola. 18,000 sq. ft. R. R. siding.

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introducing this NEW PRIME-MOVER . . . . engineered to fit your FOUNDRY OPERATIONS

This new more maneuverable PRIME-MOVER can be put to work *immediately* without enlarging doors, increasing aisle space, or rearranging facilities.

PRIME-MOVER hauls ¾ ton loads of coke, sand, melting scrap, knockout; or with interchangeable flatbed it hauls castings, flasks, boxes. Requires no more operating space than laborwasting hand wheelbarrows.

The new PRIME-MOVER is built for foundry duty. Its all gear transmission is completely *enclosed against* foundry dust and grit. Its dependable 6 HP, 4 cycle engine is *housed to prevent damage* and is *protected against wear* by an oil bath air filter.

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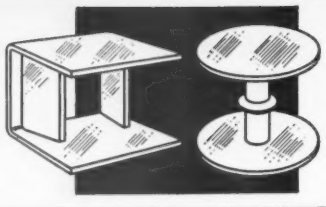

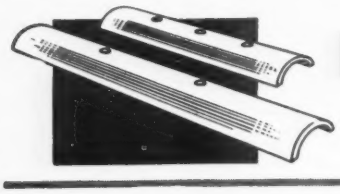

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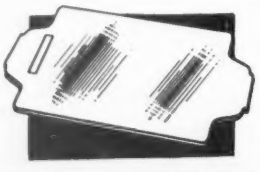
. . . all gauges and radii.

Pattern Plates

. . . aluminum and Dowmetal



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211 CHANDLER ST., BUFFALO 7, N. Y.

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Accurate Duplicate Patterns are required for Precise Matchplates

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Consider these advantages in using Cerro Alloys for duplicate metal patterns:

- *Non-Shrinkage* — Cerro Alloys expand into mold when they solidify, pick up detail and dimensions.
- *Speed*—no time lost in mixing, curing or setting chemicals or powders.
- *Salvageable*—Cerro Alloy patterns are returned to melting pot after foundry molding for re-use indefinitely.

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Published monthly by

THE PENTON PUBLISHING COMPANY

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Also publisher of STEEL • MACHINE DESIGN NEW EQUIPMENT DIGEST • AUTOMATION

Subscription: United States, possessions and Canada, one year $5; two years $8. Other foreign countries, one year, $10. Single copies 75 cents. Copies published three months or more previous to date of current issue, $1.00.

Member: National Business Publications, Inc.; and Society of Business Magazine Editors.

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Second class mail privileges authorized at Cleveland, Ohio.

FOUNDRY *is indexed regularly by* Engineering Index Inc. 29 West 39th St., New York 18.

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call on

Foundry's PLUS 5 SERVICE

to put extra push behind your sales program

What is PLUS 5? It's your key to more business from foundries. It gives every FOUNDRY advertiser a bonus he can get from no other source. Here is help in analyzing this market—studying sales territories and potentials—planning the sales effort—and creating a constructive promotion program to the 5 billion dollar foundry market. It's time to take a new look at this market—and at the unusual selling aids we have for you. Say PLUS 5 to your FOUNDRY representative and he'll show you this 5-step program designed to move more of your products into foundries.

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FOUNDRY

more than a magazine . . . a complete sales development service

Penton Building, Cleveland 13, Ohio

No Jiggle! No Jog!

'ROUND & 'ROUND IT GOES

. . . and sifts sand fluffier—mixes it better!

COMBS FOUNDRY RIDDLES

WORLD FAMOUS!

TYPE "CR"

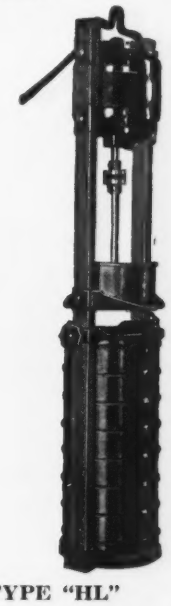
24″ dia. round sieve. Thoroughly sifts, mixes, fluffs, aerates the sand. ⅓ H.P. enclosed motor. Height 4′6″, weight 250 lbs. Complete: $350.00

TYPE "V"

Screens sand Fine, Coarse, Medium. 20″ dia. sieve with special clamp for 5-second changes. Does work of 10 men. Fully-enclosed 1/6 h.p. motor. 4′6″ high, weight 100 lbs. 20″ Sieve: $275.00. Giant V-5, 36″ Sieve: $495.00.

TYPE "CS"

24″ square sieve. Continuous operation, no dumping. Refuse tails off to one side. Height 4′10″, weight 295 lbs. With ⅓ h.p. enclosed motor. Complete: $360.00



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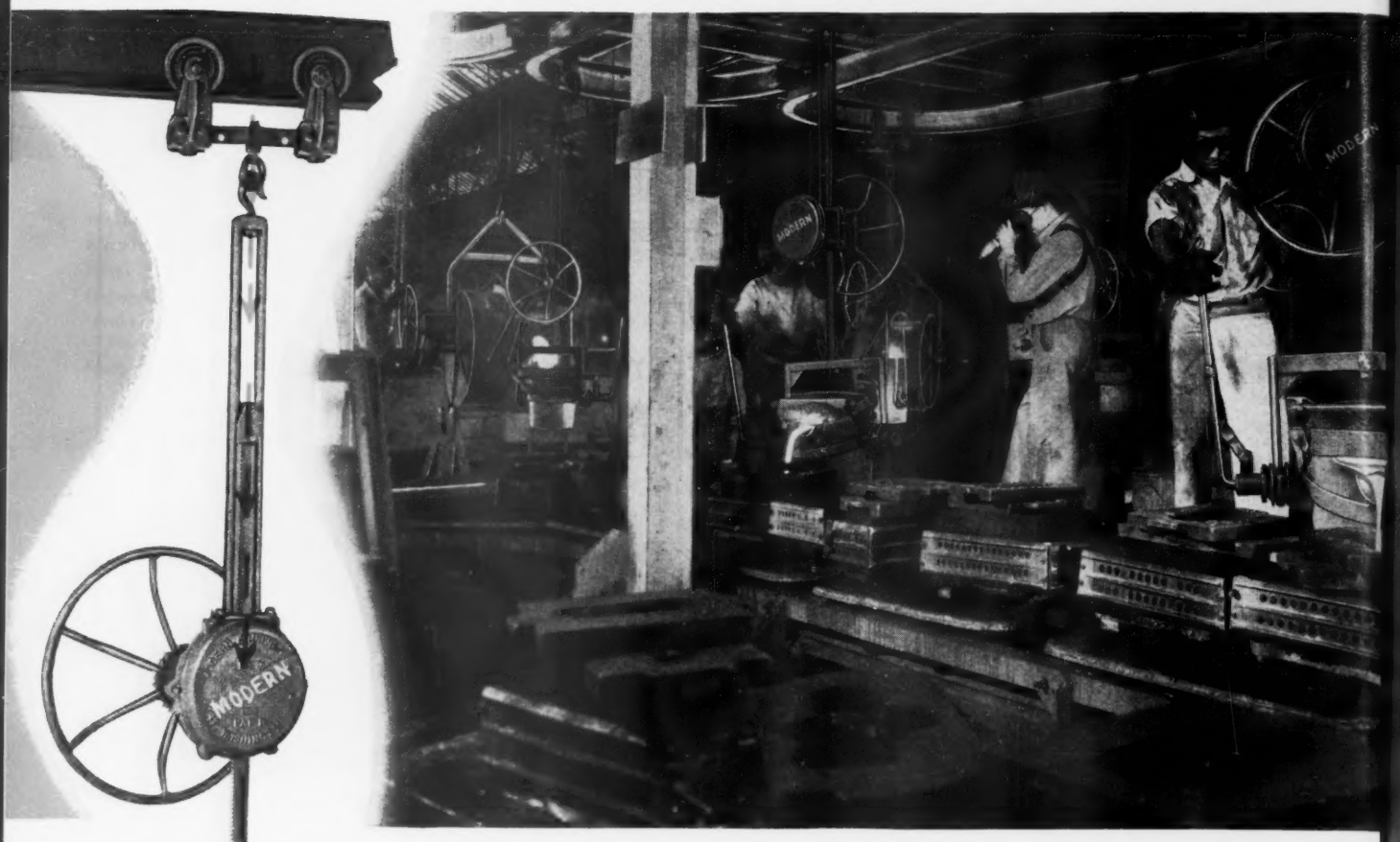
PROMPT DELIVERY FROM YOUR FOUNDRY SUPPLY HOUSE

GREAT WESTERN MFG. CO.

LEAVENWORTH, KANSAS

For more information, use Reader Service Card, page 201

A LIFT for your POUR-OFF-MEN



Rigid, straight-line control from monorail to ladle spout for quick accurate spotting over the sprues.

WORKING TOGETHER WITH PRACTICAL FOUNDRYMEN...

MODERN engineers developed the Pouring Device. That's how our business began!

Today this MODERN one-man-pouring method, as proved in a quarter century's service to foundries, is highly productive — both for the foundry that sets up a floor or two a day, as well as for the large manufacturer* with his most elaborate, double-loop conveyor system.

The MODERN cylindrical ladles, together with their 2000 pound loads of gray iron, are trucked from the cupolas to the pouring floor. In this MODERN equipped operation up to 70 tons of tractor cylinder liners, heads and manifolds are poured in an 8 hour shift. Several of the ladles and the MODERN "FA" Pouring Devices have been in operation since 1938. Herein is a timely story on the effective distribution of manpower. You can read more about it in catalog P-152-A: Free to foundrymen who make request on their company letterheads to — Dept. F-3, MODERN EQUIPMENT COMPANY, Port Washington, Wisconsin.

*Allis-Chalmers, Milwaukee

MODERN EQUIPMENT CO.
PORT WASHINGTON, WISCONSIN

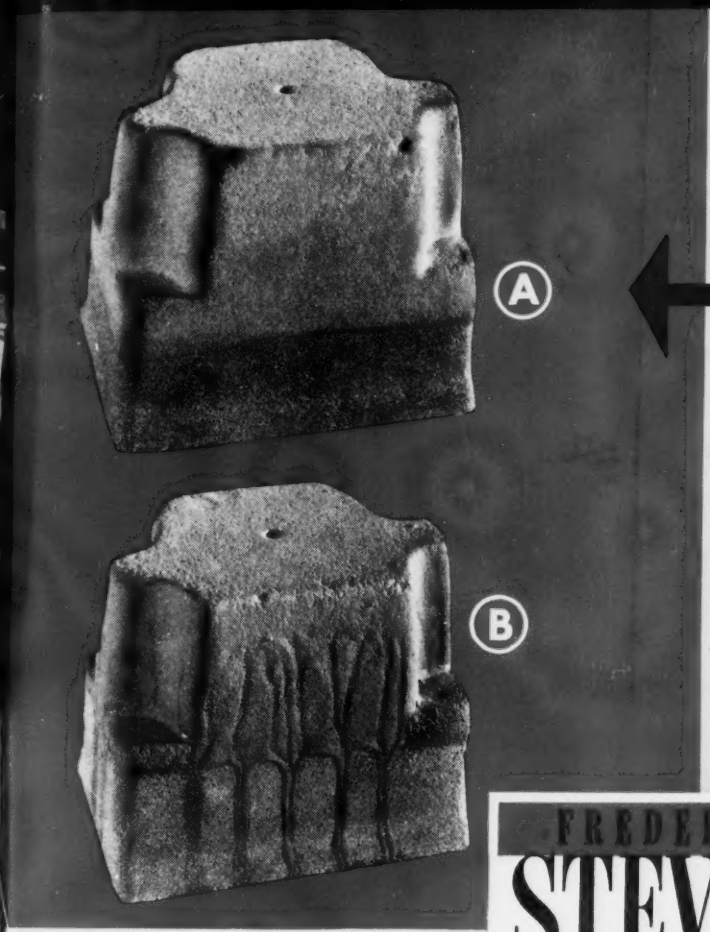
OTHER FREE CATALOGS

Large Ladles *P-152*
Cupolas and Chargers ..... *No. 147-A*
Monorails, Cranes, Switches ... *No. 150*

THEY'RE NEW! THEY'RE DIFFERENT!

2 NEW STEVENS CORE COATINGS

FOR BETTER CASTINGS—AT LOWER COST



STEVENS GRAPH-KOTE

A GRAPHITE CORE COATING

The unretouched illustrations at the left show (A) a core that has been dipped in the new Stevens Graph-Kote Core Coating while (B) shows another core dipped in an ordinary core coating. Observe the difference between these two coatings. Stevens Graph-Kote shows no bleed, no run-down, no tear-drops, no build-up, while the other coating shows all of these defects. The new Stevens Graph-Kote produces better castings at lower cost when used on cores and molds for grey iron, non-ferrous and alloy castings. It produces a true grey iron color on castings.

STEVENS RED-SKIN

A REFRACTORY CORE COATING

Below are shown unretouched photographs of (C) a core dipped in the new Stevens Red-Skin Core Coating and (D) a similar core dipped in a standard type carbon-free core coating. Note the difference between these coatings. Stevens Red-Skin does not run, streak, tear-drop or pile up at the edge of the core. The other coating shows inferior application. The new Stevens Red-Skin reduces costs and aids in the production of better castings when used on molds and cores for steel, grey iron and non-ferrous. It is carbon-free and is highly refractory.

FREDERIC B. STEVENS INCORPORATED
EVERYTHING FOR A FOUNDRY
DETROIT 11, MICHIGAN

After months of research, formulation and testing in foundries under varied conditions, the Stevens Laboratories are proud to introduce two new and different core coatings — Stevens Graph-Kote and Stevens Red-Skin. Both have advantages to foundrymen.

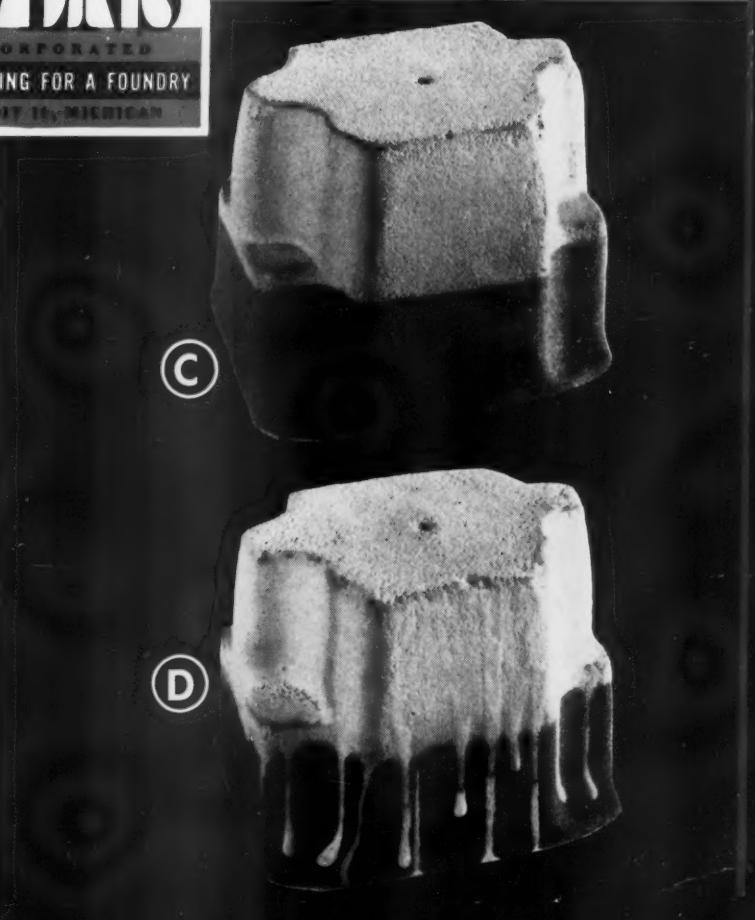
Will Reduce Labor Cost: Since both Graph-Kote and Red-Skin are "short" they coat only where a coating is needed. The dip line is sharp. No run-downs, sags, tear-drops or build-up to clean from cores. Cores can be dipped faster, core prints and assemblies fit accurately and conveyors and oven racks are kept cleaner.

Both Have Deep Penetration: For protection against metal penetration Graph-Kote and Red-Skin seal several layers of sand to insure easy peel from castings. An even, uniform coating gives ample coverage to produce clean castings.

Are Tough and Rugged: Will withstand the most severe conditions of impinging and flowing metal since the coatings are firmly anchored to mold and core surfaces and are resistant to high pouring temperatures.

Other Advantages: Stevens Graph-Kote and Red-Skin form smooth, foam-free solutions. They are ready to use, with no waiting period, as soon as they are completely mixed. Can be stored indefinitely without deteriorating in polyethylene lined containers.

To get better castings at lower cost investigate Stevens Graph-Kote and Red-Skin Core Coatings today.



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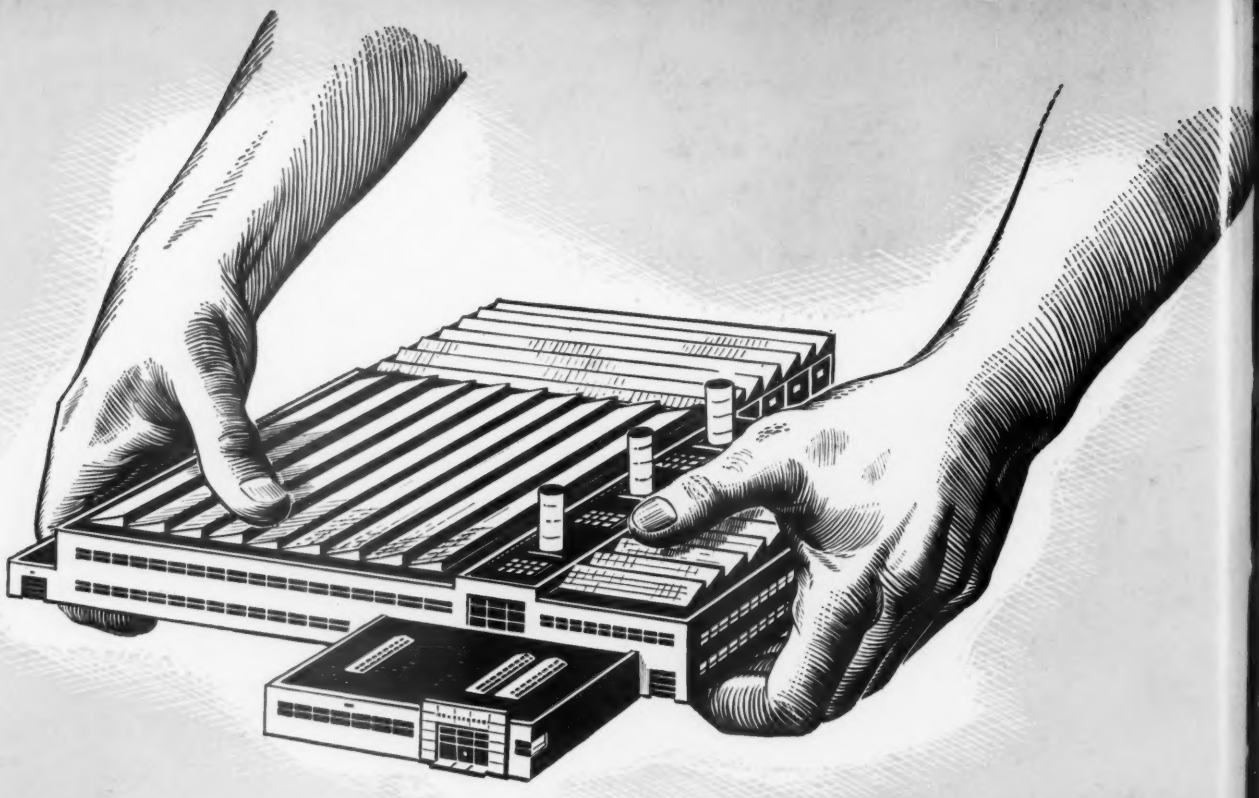

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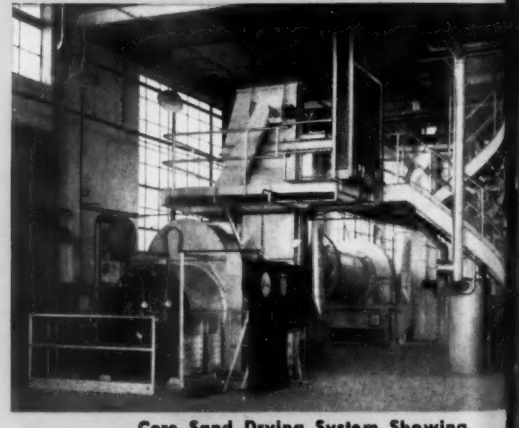
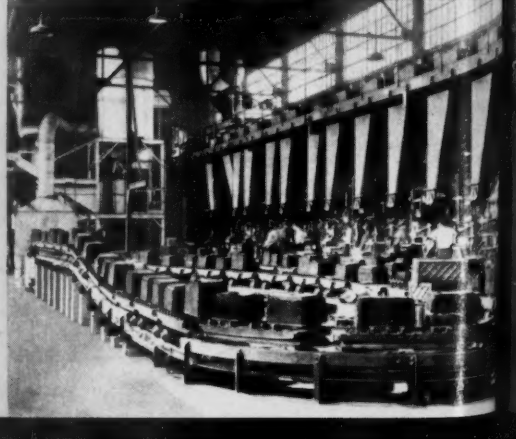
● Get a better, more efficient foundry — quicker — at lower cost — and protect your competitive position in the years ahead by letting our **experienced** foundry **specialists** handle the entire project. Why buy equipment when you can buy results? Get the **full** advantage of the many economies that synchronized departmental operation — automation — and the latest foundry techniques make possible. We have been privileged to serve many of the country's largest, best known foundries. *Let us help you too!*



Core Sand Drying System Showing Combination Dryer-Cooler.

View in Large Jobbing Foundry Showing Sa Plant, Molders Hoppers and Mold Conveyer.



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